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ABSTRACT

This report describes what has been done to implement the Occupational Safety and Health Act of 1970 during its first year of operation. The report examines the responsibilities of the Department of Labor for setting safety and health standards and also explores the activities of the Department of Health, Education, and Welfare in research and training. Implementation of the Act included cooperative programs with state governments. Among the data in the report are work-injury rates by industry for the period 1958-70, occupational safety and health grants and contracts, and hazard surveys. (MF)

ED 074300

# THE PRESIDENT'S REPORT ON OCCUPATIONAL SAFETY AND HEALTH

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# THE PRESIDENT'S REPORT ON OCCUPATIONAL SAFETY AND HEALTH

# INCLUDING REPORTS ON OCCUPATIONAL SAFETY AND HEALTH

## BY THE UNITED STATES DEPARTMENT OF LABOR

(PAGE 1)

## AND BY THE UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

(PAGE 99)

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TO THE CONGRESS OF THE UNITED STATES:

On-the-job protection of American workers continues as a high priority goal in this Administration's effort to improve the quality of life for all Americans.

The Occupational Safety and Health Act of 1970, which I signed into law on December 29, 1970, is a major step towards improving workplace conditions. As I said at that time, this legislation is one of the most important measures ever taken in behalf of those American workers who are covered by the provisions of the Act.

The accompanying *President's Report on Occupational Safety and Health* describes what has been done to implement the Act during the first year of its operation, and it also indicates the magnitude and direction of the task ahead. The report examines the responsibilities of the Department of Labor for setting safety and health standards, and for gaining compliance with those standards. Another part of the report explores the activities of the Department of Health, Education, and Welfare in research and training.

Like many problems that we face today, the improvement of job safety and health cannot be accomplished by simply pressing a button. If we are to reduce the injuries, the illnesses, and the deaths connected with working conditions, we must take determined actions: we must increase the number of people who are trained in health and safety techniques; knowledge of the causes of accidents and illnesses must be developed; this knowledge must be translated into effective standards; employers and employees require adequate instructions; and standards must be enforced through energetic and rigorous inspection programs.

Above all else, if we are to be successful, the full collaboration of private industry, the States and the employees must be enlisted.

The Occupational Safety and Health Act of 1970 recognizes the need of reinforcing the role of the States in resolving our national problems. As a consequence, the implementation of the Act has emphasized cooperative programs with State Governments. The involvement of the States in these programs has been gratifying. It is a testimonial to the flexibility and vigour of our Federal-State system that the fifty States, the District of Columbia, Puerto Rico, Guam and the Virgin Islands have all expressed a willingness to develop plans for setting and enforcing standards that are at least on a par with the Federal requirements fixed by the Act.

In addition, many States are actually aiding the Federal Government by gathering superior statistical data that will provide a basis for charting the future direction of safety and health programs. Many States, too, are now assisting the Federal Government in the enforcement of standards.

In short, I feel that the essential groundwork has been laid for genuine progress in on-the-job safety and health. This report describes the structures that have been set in place, and it outlines how the building process will continue.

Richard Nixon

THE WHITE HOUSE
*May 1972*

# REPORT ON OCCUPATIONAL SAFETY AND HEALTH BY THE U.S. DEPARTMENT OF LABOR

J.D. Hodgson,
Secretary

U. S. DEPARTMENT OF LABOR

OFFICE OF THE SECRETARY

WASHINGTON

May 3, 1972.

THE PRESIDENT

Dear Mr. President: I have the honor to submit this report pertaining to the Occupational Safety and Health Act of 1970, as required by section 26 of that act.

Respectfully,

J D Hodgson

Secretary of Labor.

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## Chapter 1

# SUMMARY STATEMENT

Occupational safety and health has long been a matter of concern in this country, but this concern has not often been translated into effective action. For years, as workers became more productive in their jobs, they were injured less frequently. The two seemed to go together; fewer injuries meant more time on the job for production. However, since 1961, the Bureau of Labor Statistics injury frequency rate for manufacturing industries (i.e., the number of disabling injuries per million employee hours worked) has risen as productivity has continued to increase. By 1970, the last year for which data are available, the injury frequency rate had risen to 15.2 from 11.8 in 1961, an increase of nearly 29 percent in 10 years.

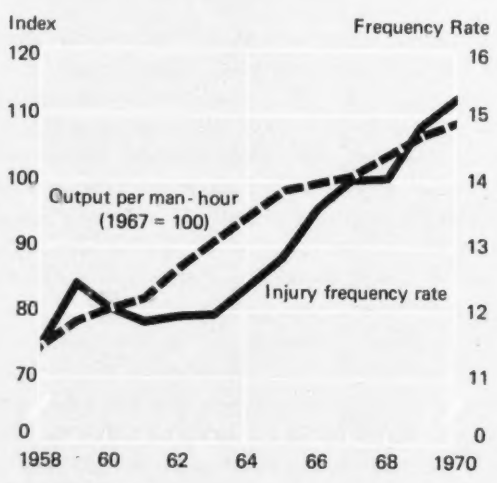
Of the 80,000,000 employed persons in today's civilian labor force, the National Safety Council estimates more than 14,000 are killed and 2.2 million suffer disabling injuries each year as a result of accidents on the job. And these statistics are only estimates. Actually, there are no reliable figures on the number of employees who suffer minor, nondisabling injuries or become ill after being exposed to hazardous conditions. Research on such substances as asbestos, cotton dust, coal dust, and others is continuing to reveal how toxic some commonly used materials can be. In its first listing in 1971, the Department of Health, Education, and Welfare (HEW) identified more than 8,000 toxic substances.

Although the total human and economic consequences of occupational injuries, illnesses, and deaths are not measurable, the Social Security Administration estimated that the total cost of workmen's compensation to employers was $4.82 billion in 1970. Workmen's compensation—the system designed to recompense the victims of occupational injuries and illnesses—has not evolved rapidly enough to adequately provide for today's needs. Some workers are not covered, and the level of benefits has in many cases fallen behind rising wage levels. In addition, illnesses and injuries have necessitated large programs for job retraining and vocational rehabilitation.

Until recently, efforts to improve occupational safety and health have been uneven and have concentrated on safety rather than on health. Many private companies have extensive programs for employee safety and health, but others have none. Programs vary from company to company, from one part of the country to another,

CHART 1

**Index of Output Per Man-Hour and Injury Frequency Rates in Manufacturing, 1958-1970**




Source: Department of Labor.

and from industry to industry. The setting and enforcement of occupational safety and health standards by State and local governments has varied from good to zero. Federal programs basically were enacted on an ad hoc basis and the resources devoted to them were not large. In the 1930's, safety provisions were included in the Walsh-Healey Public Contracts Act covering Federal procurement of supplies and in the Fair Labor Standards Act for the issuance of hazardous occupations orders to protect young workers.

The Department of Labor has responsibility for these two acts and such later statutes as the Maritime Safety amendments to the Longshoremen's and Harbor Workers' Compensation Act, the Service Contract Act, and the Construction Safety amendments to the Contract Work Hours and Safety Standards Act. Federal agencies responsible for other areas of occupational safety and health are: the Department of Interior and the Department of Health, Education, and Welfare in mining industries; the Atomic Energy Commission for workers under the Atomic Energy Act; the Department of Transportation for highway, trucking, airline, and railroad safety; and the Department of Health, Education, and Welfare for occupationally related research and training. In sum, there was a piecemeal approach to occupational safety and health programs, with the bulk of the Nation's employees unevenly covered.

## CREATION OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

A growing awareness of the scope of the problems involved with occupational safety and health as well as an increased concern for the general environment helped to create bipartisan support for the Williams-Steiger Occupational Safety and Health Act of 1970, which President Nixon signed into law on December 29, 1970. This general statute covers about three-fourths of the civilian labor force, or almost 60 million employees in about 5 million establishments (See Appendix A). In addition, special provisions of the Act pertain to the 2.7 million Federal Government civilian employees. States submitting plans for their own occupational safety and health programs must provide protection for State and local government employees. There are currently 9.7 million such employees.

Congress declared its intent in the Act to:

> . . . assure so far as possible every working man and woman in the Nation safe and healthful working conditions . . . .

As interpreted, this means that workers in agriculture, the professions, and retail and service industries are covered as well as those jobs generally classified as industrial. Coverage applies to all businesses in commerce with one or more employees. The major area of noncoverage is self-employed persons. As a matter of policy, household domestic employees and immediate family members who work on family farms are generally not subject to the requirements of the Act. In addition, to the extent that other Federal agencies exercise statutory authority affecting occupational safety and health, the Williams-Steiger Act is inapplicable.

In order to implement the Act, the Department of Labor created the Occupational Safety and Health Administration (OSHA) on April 28, 1971, the date the Act became effective. The first tasks were to issue occupational safety and health standards and to make OSHA into a viable organization to administer and enforce the Act. An initial standards package was published in the Federal Register on May 29 that included many established Federal standards and national consensus standards for general industry and some specific industries. In addition, established standards for the maritime and construction industries were adopted. A 90-day delay in the effective date to August 27 was provided to enable previously noncovered employers to familiarize themselves with the standards.

During 1971, which should be viewed as a startup period, OSHA concentrated on recruiting and training an effective compliance staff in a decentralized field structure consisting of 10 regional offices, 49 area offices and two maritime district offices in major cities across the Nation; on attempting to inform employers and employees about the Act and its requirements; on encouraging voluntary compliance; on emphasizing the need for improvement in five target industries selected primarily because of their history of high injury frequency rates; on five target health hazards representing particularly hazardous exposures for employees; and on improving job safety and health programs in the Federal agencies. Through the Bureau of Labor Statistics in cooperation with HEW, a new and mandatory national

injury and illness reporting system was developed and is being implemented.

In making inspections, stress is placed on investigating fatalities and catastrophes, on responding to the valid complaints of employees, and on inspecting the five target industries and the five target health hazards. To aid in the Target Industry Program, eight States have agreed to perform about 4,000 inspections for OSHA. In addition, State compliance programs were preserved by the signing of agreements with 47 States and four other jurisdictions. The target industries selected are: marine cargo handling, roofing and sheet metal work, meat and meat products, miscellaneous transportation equipment (primarily mobile homes), and lumber and wood products. These industries have injury frequency rates of more than 34 injuries per million employee hours worked and together employ about 1.3 million persons. A similar approach has been designed for the five target health hazards. The five substances to be concentrated on are asbestos, lead, silica, carbon monoxide, and cotton dust. In addition to these priority enforcement programs, a broad cross-section of establishments is being inspected to cover all industries, geographic areas, and employment sizes.

By the end of 1971, 14,452 inspections had been made in establishments employing almost 2.5 million workers. The inspections disclosed 35,839 alleged violations for which citations were issued proposing penalties in the amount of $737,486. Of these citations, 358 have been contested with the Occupational Safety and Health Review Commission.

Training and education are key elements in the success of any safety and health program. The Labor Department is responsible for short-term training of compliance personnel and other staff, both Federal and State. It is also responsible, in consultation with Secretary of Health, Education, and Welfare, for developing and conducting courses for employers and employees, and for preparing and distributing educational materials. By the end of 1971, 344 compliance officers had been trained, including 68 State personnel assisting in the Target Industry Program. All Federal compliance officers will have attended retraining courses at OSHA's Chicago Training Institute by the end of fiscal 1972.

The Department is working closely with State governments to aid and encourage them in developing plans for their own occupational safety and health programs which will be "at least as effective as" the Federal program, as required by the Act. The Secretary must evaluate the plans developed and submitted by the States to ensure their effectiveness. For approved plans, he is authorized to fund the States up to 50 percent of the program cost. All 50 States, the District of Columbia, Puerto Rico, and Guam have indicated an interest in developing operating plans. To aid in this planning, 90–10 grants have been made to 46 States, the District of Columbia, and Puerto Rico.

The specific activities of the Department of Labor are spelled out in detail in the following chapters, with relevant statistical tables in the appendices. To help keep Congress informed, a report was also submitted covering the first 6 months' activities under the Act.

## GENERAL OUTLOOK

The Williams-Steiger Occupational Safety and Health Act is a general statute providing a broad spectrum of powers for use by the Secretary in reducing exposure to hazardous conditions in the workplace. The task is formidable. It is far too early at this time to validly assess the effectiveness of the Act's provisions in accomplishing the goal of assuring safe and healthful working conditions.

However, the program's first year of operation has produced the following conclusions:

1. It will not be easy to attain the goal of assuring a safe and healthful workplace for the Nation's workers, and it cannot be done quickly. Effective enforcement of the Act will be critical, but it alone will not do the job. Cooperation among all levels of government and the voluntary compliance of both employers and employees are essential ingredients for success.

2. As many as half the States may have submitted approvable operating plans and be running their own programs with 50 percent grant funding from the Department by the end of fiscal year 1973.

3. Accident cause studies and related research to date have provided only limited knowledge as to the possible relationships of work injuries and illnesses to such factors as the nature of the industry, the level of technology and mechanization, the prevalence of piecework, average hours of work and overtime, assembly line work and job satisfac-

tion, expenditures for safety and health equipment and supplies, experience on the job, labor turnover, and the presence of industry safety and health programs. Health research in particular will be time-consuming.

4. Labor and management must work together to promote safety and health. Collective bargaining offers one way in which the two groups can effectively come to grips with safety and health problems at the worksite.

5. Improved reporting systems instituted by the Bureau of Labor Statistics will result in listing a great many more injuries. For the first time national illness data will be required. Changed definitions of what is an injury will result in a more complete recording of accidents. Also, as employers gain experience with the recordkeeping system, more accurate reporting will result. This reporting system is not comparable to past statistics on injury frequency and severity rates. The result will be that the picture will tend to look much worse before it starts to improve, but this should not be interpreted to mean that progress is not now being made.

## Chapter 2

# THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND RELATED ORGANIZATIONS

## THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

The Occupational Safety and Health Administration (OSHA) came into existence officially on April 28, 1971, the date the Williams-Steiger Occupational Safety and Health Act became effective. It is the organization created by the Department of Labor to discharge the Department's increased responsibilities and to make effective use of new resources provided. The first year of implementation has been one in which OSHA has made rapid strides in establishing its program in workplaces throughout the Nation.

### Major Authorities, Functional Areas, and Responsibilities

The Act grants the Secretary of Labor the authority, among other things, to promulgate, modify, and revoke safety and health standards; to conduct inspections and investigations and to issue citations, including proposed penalties; to require employers to keep records of safety and health data; to petition the courts to restrain imminent danger situations; and to approve or reject State plans for programs under the Act. The Secretary's authority includes right of access to the records of other Federal agencies, and a shared responsibility with other Federal agency heads for the adequacy of programs in the organizations reporting to them.

The Act authorizes the Secretary to conduct short-term training of personnel involved in performance of duties related to his responsibilities under the Act, and, in consultation with the Department of Health, Education, and Welfare, to provide training and education to employers and employees. The Secretary and his designees are authorized to consult with employers, employees, and organizations regarding prevention of injuries and illnesses. The Secretary, after consultation with the Secretary of Health, Education, and Welfare, may grant funds to the States for identification of program needs and plan development, experiment and demonstration, and administration and operation of programs. In conjunction with the Secretary of Health, Education, and Welfare, the Secretary is charged with developing and maintaining a statistics program for occupational safety and health.

### Major Duties Delegated by the Secretary of Labor

In establishing the Occupational Safety and Health Administration, the Secretary of Labor delegated to the Assistant Secretary for Occupational Safety and Health authority and responsibility for safety and health programs and activities of the Department of Labor, including responsibilities derived from:

1. Occupational Safety and Health Act of 1970;
2. Walsh-Healey Public Contracts Act of 1936, as amended;
3. Service Contract Act of 1965;
4. Public Law 91–54 of 1969 (construction safety amendments);
5. Public Law 85–742 of 1958 (maritime safety amendments);
6. National Foundation on the Arts and Humanities Act of 1965;
7. Federal safety program under 5 U.S.C. 7902.

The delegated authority includes responsibility for organizational changes, for coordination with

other officials and agencies having responsibilities in the occupational safety and health area, and for contracting.

At the same time, the Commissioner of the Bureau of Labor Statistics was delegated the authority and responsibility for developing and maintaining an effective program of collection, compilation, and analysis of occupational safety and health statistics, providing grants to the States to assist in developing and administering programs in such statistics, and coordinating functions with the Assistant Secretary for Occupational Safety and Health.

The Solicitor of Labor is assigned responsibility for providing legal advice and assistance to the Secretary and all officers of the Department in the administration of statutes and Executive Orders relating to occupational safety and health. In enforcing the Act's requirements, the Solicitor of Labor also has the responsibility for representing the Secretary in litigation before the Occupational Safety and Health Review Commission, and, subject to the control and direction of the Attorney General, before the Federal courts. A separate division under the direction of an Associate Solicitor for Occupational Safety and Health is established in the national office, and additional staff is assigned to each Regional Solicitor to support the program.

### Organizational Structure and Operations

OSHA is headed by the Assistant Secretary of Labor for Occupational Safety and Health as prescribed by the Act. He is assisted by a Deputy Assistant Secretary/Administrator, and supported by a national office staff. The program is executed primarily through the 10 regional offices, 49 area offices, and two maritime district offices. Authorized manpower for fiscal year 1972 is 1,100 employees, with 756 in the field and 344 at the national office.

The program Offices of Compliance and Standards, Training and Education, State Programs, and Federal Agency Programs report through the Director of Program Operations to the Deputy Assistant Secretary/Administrator and to the Assistant Secretary. The Regional Administrators also report directly to the Deputy Assistant Secretary/Administrator, thus maintaining decentralized authority while assuring direct access to policy levels in OSHA. The Offices of Management Services, Management Data Systems, and Information Services—the administrative support offices—also report to the Deputy Assistant Secretary/Administrator.

The structure of the Occupational Safety and Health Administration is designed to promote decentralized exercise of authority. The Regional Administrators have broad authority for execution of the OSHA program in their respective jurisdictions. Authority for approval of planning grants for State programs is scheduled to be moved to the regional offices in March 1972. Assistant Regional Administrators for State Programs are rapidly assuming a larger share of the State Programs workload.

### Functions of the National Staff Offices

The Office of Compliance and Standards develops and issues safety standards, regulations, and criteria for assuring compliance. It issues compliance interpretations, conducts liaison with the Department of Health, Education, and Welfare on research, demonstrations and experiments, and with the National Advisory Committee on Occupational Safety and Health on matters of standards policy.

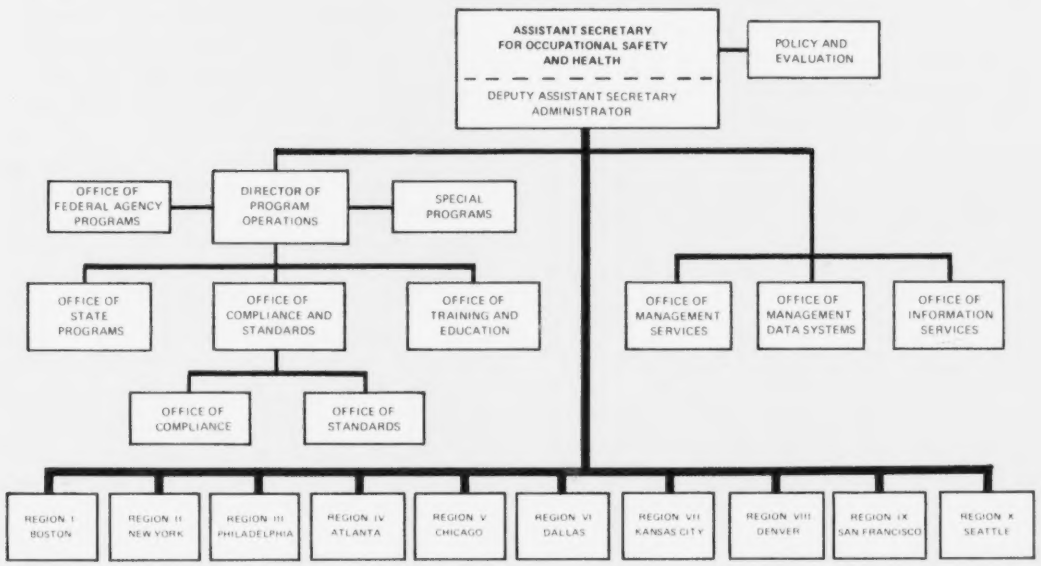
In addition, the Office of Compliance and Standards develops investigation procedures for OSHA employees, reports on investigations, and sets policy for issuance of citations and computation of proposed penalties.

The Office of State Programs develops grant policy and guidelines for State plans, and establishes criteria for evaluation of State plan proposals and administration. As basic policy is formulated, implementation responsibility is redelegated to the Regional Administrators.

The Act makes special provisions for protecting Federal, State, and local government employees, since the definition of the term "employer" in section 3(5) excludes the United States, States, and political subdivisions of States, thereby exempting Federal, State, and local government employees from coverage. State and local government employees become covered under approved section 18(b) plans. As the Nation's largest employer, the Federal Government has a special obligation to set an example for safe and healthful employment. Section 19 of the Williams-Steiger Act places new responsibility on Federal agencies to establish and maintain an effective and comprehensive occupational safety and health program consistent with the standards promulgated for the

CHART 2

**Organization of Occupational Safety and Health Administration**




Source: Department of Labor.

private sector. Executive Order 11612 was signed by President Nixon on July 28, 1971, reaffirming his commitments to the program and assigning specific responsibilities to all Federal departments and agencies. The Executive Order established a new Federal Advisory Council on Occupational Safety and Health, composed of key representatives of agencies and of unions representing Federal employees. The Assistant Secretary for Occupational Safety and Health was appointed chairman on October 12, 1971, and OSHA's Office of Federal Agency Programs serves as a secretariat to the Council.

Three major initial objectives have been established for improving Federal job safety and health programs. First, a new system for recording and reporting Federal agency occupational injuries and illnesses has been developed. Second, methods are being devised for evaluating agency programs, including agency reports on the steps they are taking to meet the applicable standards. And third, a special campaign, "ZERO-IN on Federal Safety," is now in effect to provide agency incentive and employee motivation. The "ZERO-IN on Federal Safety" program requires each Federal agency to locate the specific work hazards that affect its employees and establish goals to remove these hazards.

Under the Executive Order each agency head is required to submit a report to the Secretary of Labor by April 7 of each year that must include (1) the status of the agency's program, (2) goals and objectives for the year and a plan for achieving them, (3) reports required under section 7902(c)(2) of Title 5 of the United States Code, and (4) any other information required by the Secretary. From these, the Secretary will prepare for the President a summary report, together with program evaluation and recommendations based on the Department of Labor's review of the experience of the agencies. The President will then report to the Congress on progress to date and plans for achieving "an effective and comprehensive Federal occupational safety and health program" consistent with the OSHA standards promulgated for general application.

The Office of Training and Education is established in OSHA to train employees and em-



457-200 O - 72 - 2

ployers, to conduct safety management programs, to develop training and educational publications, and to create and operate training facilities for OSHA staff, State personnel, and others in the field. A prime accomplishment in the first year of operation was the training of all regional compliance staff members in the provisions of the Act and the methods and procedures it requires. State personnel participating in the enforcement program for target industries also were trained. The staff of the Office of Training and Education began work with the National Institute for Occupational Safety and Health on the diagnosis of training needs and the development of curricula.

Early in 1972, OSHA will open a Training Institute near Chicago to carry out its training and education responsibilities. This institute will serve as a "proving ground" for new courses which will then be made generally available.

The Office of Management Data Systems serves as the principal staff office for management information support on occupational safety and health activities and disseminates statistical data for use by the program managers in area, regional, and national offices.

The Office of Information Services provides specialized educational services through the public media, including news releases, the development of general and specialized publications on occupational safety and health, and the distribution of forms, posters, and regulations as required by the Act.

The Office of Management Services supplies general office services, personnel services, fiscal management, and management analysis services to the organization.

#### Regional Offices

OSHA is divided geographically into 10 Federal regions, each headed by a Regional Administrator who is its chief executive officer and is responsible for program direction and execution within the broad policies and standards outlined by the Assistant Secretary. Each Regional Administrator is supported by three Assistant Regional Administrators and several Area Directors.

The Assistant Regional Administrator for State Programs is responsible for coordination of State Programs activities in the region, negotiation of program plans, administration of grants, drafting of agreements, accreditation and contracts with the States and related bodies, analysis and evaluation of State and other non-Federal program participation; Federal-State liaison for occupational safety and health matters in the region; and liaison with intergovernmental groups.

The Assistant Regional Administrator for Compliance is responsible for compliance and inspection activities in the region; information, training education, and consultation with employers and employee groups; guidance to area offices on compliance policy, voluntary compliance programing, and coordination with the Solicitor of Labor on matters of litigation.

The Assistant Regional Administrator for Technical Support is responsible for industry, State, and Federal consultation on safety engineering, industrial hygiene, and related technical matters.

Within overall national guidelines, Area Directors are responsible for scheduling and executing investigations of compliants, regular target industry inspections, and local information requests.

#### Appropriation of Funds

Appropriations to carry out the provisions of the Act are requested by the Secretary of Labor, who in turn makes funds available to Departmental officials commensurate with program commitments.

Immediately upon enactment of the Act, the Department of Labor requested a supplemental appropriation to make funds available for the balance of fiscal year 1971. An additional $9.1 million was appropriated by the Congress. This amount, added to the $6.1 million appropriated to the former Bureau of Labor Standards, brought the 1971 appropriation to a total of $15.2 million.

In fiscal year 1972, the Department received $37.5 million from the Congress for administration of the Act. These funds also support the Occupational Safety and Health Review Commission, the National Advisory Committee on Occupational Safety and Health, and the National Commission on State Workmen's Compensation Laws.

In fiscal year 1973, the Department has requested $67.5 million from the Congress, an increase of $30.3 million over the 1972 appropriation; of this increase $8.7 million is for the Federal program and $21.6 million for the States.

CHART 3

**Occupational Safety and Health Administration Regional and Area Offices**

| X | IX | VIII | VII | VI | V | IV | III | II | I |
|---|---|---|---|---|---|---|---|---|---|
| SEATTLE | SAN FRAN. | DENVER | KANSAS CITY | DALLAS | CHICAGO | ATLANTA | PHILA. | NEW YORK | BOSTON |
| Seattle | San Fran. | Denver | Kansas City | Dallas | Chicago | Atlanta | Phila. | New York | Boston |
| Anchorage | Long Beach | Billings | Omaha | Houston | Cincinnati | Birmingham | Baltimore | Long Island | Concord |
| Portland | Phoenix | Salt Lake | St. Louis | Lubbock | Cleveland | Charlotte | Norfolk | Newark | Hartford |
| | Honolulu | | | New Orleans | Columbus | Ft. Lauderdale | Pittsburgh | Syracuse | |
| | | | | Tulsa | Detroit | Jacksonville | Richmond | San Juan | |
| | | | | | Indianapolis | Louisville | | | |
| | | | | | Milwaukee | Nashville | | | |
| | | | | | Minneapolis | Savannah | | | |
| | | | | | Toledo | Mobile | | | |

Source: Department of Labor.

[Dollars in thousands]

| | Fiscal year 1971 | Fiscal year 1972 | Fiscal year 1973 |
|---|---|---|---|
| Total funds authorized | $15,200 | $36,456 | [1] $67,500 |
| Positions | 970 | 1,708 | 1,844 |

[1] Amount requested by the President from the Congress.

## RELATED ORGANIZATIONS

### National Advisory Committee on Occupational Safety and Health

Section 7(a) of the Act establishes a "National Advisory Committee on Occupational Safety and Health consisting of 12 members appointed by the Secretary, four of whom are to be designated by the Secretary of Health, Education, and Welfare (HEW), and composed of representatives of management, labor, occupational safety and occupational health professions, and of the public." The Act directs the Secretary to designate one of the members as chairman, and requires that the members shall be selected upon the basis of their experience and competence in the field of occupational safety and health.

The Committee advises, consults with, and makes recommendations to the Secretary of Labor and the Secretary of Health, Education, and Welfare on matters relating to the administration of the Act.

On July 22, 1971, the Secretary of Labor announced the appointment of the Committee as follows:

Howard Pyle, Chairman
President
National Safety Council
Chicago, Ill.

Dr. John V. Grimaldi, Director
The Center for Safety
New York University
New York, N.Y.

Dr. Richard Sutter
Medical Director
Sutter Clinic, Inc.
St. Louis, Mo.

Miss Sara P. Wagner
Director of Nurses
Medical Department
Standard Oil Co. (N.J.)
New York, N.Y.

John J. Sheehan
Legislative Director
United Steelworkers of America
Washington, D.C.

George H. R. Taylor
Executive Secretary
AFL–CIO Standing Committee on Occupational Safety and Health
Washington, D.C.

Frank R. Barnako
Manager, Safety and Workmen's Compensation Division
Industrial Relations Department
Bethlehem Steel Corp.
Bethlehem, Pa.

Roscoe W. Batts
Vice President
Industrial Relations
International Harvester Co.
Chicago, Ill.

Barry C. Brown
Director
Department of Labor
Michigan State
Lansing, Mich.

Leif Thorne-Thomsen
Public Health Administrator
Department of Health and Welfare
Juneau, Alaska

Donald Peyton
Managing Director
American National Standards Institute
New York, N.Y.

Roger H. Wingate
Vice President
Liberty Mutual Insurance Co.
Boston, Mass.

Members designated by the Secretary of HEW were Miss Wagner, Dr. Sutter, and Messers Wingate and Thorne-Thomsen. The Secretary of Labor furnishes an executive secretary and such other secretarial, clerical, and other services as are needed by the Committee.

Special attention was given at the first meeting of the Committee in August to reviewing the steps taken to implement the new program by the OSHA staff of the Department of Labor and the staff of the National Institute for Occupational Safety and Health of HEW. Major activities reviewed included standards development, compliance procedures, State programs, training, and statistics. The main item of importance at the September meeting of the Committee concerned State programs, including detailed discussion of State agreements, State grants, and other legal and technical aspects of the program. Committee members contributed valuable suggestions to assist staff members.

### Advisory Committees on Standards

Other advisory committees may be appointed by the Secretary under section 7(b) to assist him in his standards-setting function. Each committee is to consist of not more than 15 members, one or more of whom is designated by the Secretary of HEW, and is to include an equal number of persons qualified to represent the viewpoints of employers, employees, and safety and health agencies of the States. Such committees are being constituted for tunneling, asbestos, and agriculture. In addition, the Construction Safety Advisory Committee, which was appointed under the Construction Safety Act, has continued to give assistance in situations relating to the construction industry.

### Occupational Safety and Health Review Commission

The Occupational Safety and Health Review Commission is an independent agency of the Executive branch of the United States Government, established under section 12 of the Act. It consists

of three members appointed by the President, and a staff selected by and responsible to the chairman who is designated by the President to be the administrative head of the agency.

Its functions are adjudicatory. When an employer contests a citation issued by the Secretary of Labor or when an employee or a representative of employees contests the time established by the Secretary for the abatement of a condition or practice which the Secretary has found to be in violation of the Act, the Commission designates one of its hearing examiners to preside over the hearing of the case. In contested cases, the Solicitor of Labor prosecutes, and respondent employers defend. Where an employee or a representative of employees contests the reasonableness of an abatement period, the moving party bears the burden of proceeding.

Following the hearing, the Commission's hearing examiner issues a recommended decision and order. That recommended decision and order become the final order of the Commission unless a Commissioner orders review. Following such review, the Commission issues an order based on findings of fact, affirming, modifying, or vacating the Secretary's citation or proposed penalty, or directing other appropriate relief.

Members of the Commission are:

Robert D. Moran, Chairman
James F. Van Namee
Alan F. Burch

### Small Business Administration Activities

With the cooperation of the Small Business Administration (SBA), procedures have been established for the implementation of section 28 of the Occupational Safety and Health Act whereby SBA is authorized to provide financial assistance in the form of loans and loan guaranties to small business concerns likely to suffer substantial economic injury as a result of the Act.

Small business firms may apply for SBA financial assistance when they wish to voluntarily meet the safety and health standards or after they have received a citation from OSHA. The Department of Labor reviews the plans outlined in the loan application to ensure that changes made will conform to applicable safety and health standards. All SBA field offices received an interim bulletin outlining the scope of the loan program and containing specific instructions for counseling, interviewing, accepting, screening, and processing OSHA loan applications. The interim bulletin was followed by a national SBA policy directive and a national procedure manual setting forth in detail SBA's program for loan applications under the Act.

Two factsheets have been developed and are in use. An OSHA factsheet, containing material provided by SBA, is used for inclusion in letters and notices sent out by OSHA. SBA has also prepared a factsheet for small business concerns seeking information on the program from that agency.

Since full implementation of the loan program was not finalized until late in 1971, actual lending activity has been nominal. Some loans that may have been eligible under the program were made under the regular business loan program of SBA.

### Liaison Activities With Other Federal Agencies

Section 4(b)(1) makes the Act inapplicable to working conditions to the extent other Federal agencies exercise authority under their laws. However, it is clear that by this clause Congress intended only to avoid duplication of effort by Federal agencies in establishing a national policy of occupational safety and health protection. No gaps in coverage were contemplated.

The Department of Labor has been negotiating with other Federal agencies not only to resolve any conflicts that might arise under section 4(b)(1) situations, but also to find the best means of coordinating its responsibilities, and of developing interagency cooperation to achieve the common goal of providing the most effective national program for reducing exposure to occupational hazards. During 1971, 22 Federal agencies and their administrations were contacted to determine areas of interface with OSHA and to promulgate any required administrative agreements, in accordance with the Act.

Review of the numerous relevant statutory authorities revealed complexities that required in-depth assessment for a clear understanding of the diverse intents, scope, and authorities of the various legislative acts. Subject areas requiring particular consideration and resolution with other Federal agencies included extent of authority, types of established safety standards and regulations, enforcement authority, requirements for injury and fatality reporting, and scope of State plan agreements. Priority in-depth discussions with Federal agencies indicating critical interface

CHART 4

**Status of Liaison Activities with Other Federal Agencies, 1971**

| Agency | Initial Contact | Working Relationship Established | Agreements in Process | Agreements Finalized |
|---|---|---|---|---|
| ATOMIC ENERGY COMMISSION | • | • | • | |
| DEPARTMENT OF INTERIOR | • | | | |
| Federal Bureau of Mines | • | • | • | |
| (Other Agencies) | • | | | |
| DEPARTMENT OF TRANSPORTATION | • | • | | |
| Bureau of Motor Carrier Safety | • | • | | |
| Federal Railroad Administration | • | • | | |
| Coast Guard | • | • | | |
| Federal Highway Administration | • | • | | |
| DEPARTMENT OF DEFENSE | • | • | | |
| DEPARTMENT OF COMMERCE | | | | |
| National Bureau of Standards | • | • | | |
| National Marine Fisheries Service | • | | | |
| ENVIRONMENTAL PROTECTION AGENCY | • | • | | |
| DEPARTMENT OF HEALTH, EDUCATION AND WELFARE | | | | |
| National Institute for Occupational Safety and Health | • | • | | • |
| Social Security Administration | • | | | |
| SMALL BUSINESS ADMINISTRATION | • | • | | • |
| CANAL ZONE GOVERNMENT (PANAMA CANAL COMPANY) | • | | | |
| CIVIL SERVICE COMMISSION | | • | | • |
| NATIONAL AERONAUTICS AND SPACE ADMINISTRATION | • | | | |

Source: Department of Labor.

with OSHA, such as Federal Bureau of Mines, Atomic Energy Commission, and Department of Transportation, are under way.

### National Commission on State Workmen's Compensation Laws

Section 27(d)(1) of the Williams-Steiger Act authorizes the establishment of the Workmen's Compensation Commission to undertake a comprehensive study and evaluation of State workmen's compensation laws in order to determine if such laws provide an adequate, prompt, and equitable system of compensation for injury or death related to on-the-job accidents or health hazards. The cost of workmen's compensation insurance is directly proportional to the number of persons who are hurt or become ill as a result of their jobs. The Act requires that the Commission transmit to the President and to the Congress by July 31, 1972, a final report containing a detailed statement of the findings and conclusions of the Commission, together with any recommendations resulting from the study. The Commission will cease to exist 90 days after submission of the final report.

On June 15, 1971, the following were appointed members of the Commission:

John R. Burton, Jr., Chairman
Graduate School of Business
University of Chicago

M. Holland Krise, Vice Chairman
Ohio Industrial Commission

Samuel B. Horovitz
Boston attorney

James R. O'Brien, Assistant Director
Department of Social Security
AFL–CIO

Miss Marion Martin
Maine Commissioner of Labor and Industry

John A. Greenly, President
California State College

John L. Flournoy
California Commissioner of
Workmen's Compensation Appeals Board

Michael Peevey, Director of Research
California Labor Federation
AFL–CIO

Dr. Henry Kessler
Director for Professional Education and Research
Kessler Institute for Rehabilitation

Dr. Henry F. Howe, Associate Director
Department of Environmental Public and Occupational Health
American Medical Association

Daniel T. Doherty, Chairman
Maryland Workmen's Compensation Commission

Melvin Bradshaw, Administrative Vice President
Liberty Mutual Insurance Co.

Andrew Kalmykow, Counsel
American Insurance Association

Clarence E. Carothers
Administrator of Workmen's Compensation
Ford Motor Co.

## Chapter 3

# STANDARDS

The Department of Labor's role in occupational safety and health standards development prior to passage of the Act was limited. The Walsh-Healey Public Contracts Act of 1936, the Service Contract Act of 1965, and Construction Safety Act of 1969 produced standards applicable only to employers and places of employment subject to the terms of Federal contracts. The Department also had existing standards applicable to longshoring and shipyards for activities conducted upon navigable waters and subject to the safety of the 1958 amendments to the Longshoremen's and Harbor Workers' Compensation Act. In addition, the Department had existing standards for farm labor and youth based on the authority provided by the Fair Labor Standards Act of 1938 and the Manpower Development and Training Act of 1962. Safety engineers of the Department served on standards committees of the American National Standards Institute, Inc. (ANSI), National Fire Protection Association (NFPA), and other organizations engaged in the development of voluntary consensus standards.

Under the Williams-Steiger Act, the Secretary is empowered to issue mandatory occupational safety and health standards that he determines will assure safe and healthful working conditions. Basically, three procedures are provided for the development and promulgation of standards:

(1) Adoption of national consensus standards and established Federal standards without regard to the requirements of the Administrative Procedures Act. Congress considered that these standards had already been subject to public review and comment by affected parties. The power to adopt standards by these procedures will expire on April 28, 1973;

(2) Issuance, modification, or revocation of standards under the detailed procedures of section 6(b) of the Act providing for advisory committees, and an opportunity for public hearings and comment; and

(3) Issuance of temporary emergency standards under the authority provided in section 6(c) which become effective immediately upon publication in the Federal Register. However, section 6(c) provides that upon the publication of an emergency temporary standard, the Secretary shall commence a rulemaking proceeding in accordance with section 6(b) of the Act, and that the emergency standard as published shall also serve as a proposed rule for the section 6(b) proceeding. Before an emergency standard can be adopted, it must be determined both that employees are exposed to grave danger from toxic agents or substances or new types of hazards and that the standard is necessary to protect employees from such danger. One temporary emergency standard, for asbestos, was issued on December 7, 1971, after a request was received from the AFL–CIO. The temporary standard reflects the maximum exposure level to asbestos dust prescribed by the American Conference of Governmental Industrial Hygienists in its notice of intended changes in 1971.

An initial package of safety and health standards for general industry was published in the Federal Register under 29 CFR Part 1910 on May 29, 1971. This package also adopted under the Act previously existing Federal standards for maritime and construction. A discussion of the development of these standards is contained in the following sections.

### GENERAL INDUSTRY STANDARDS

The Walsh-Healey standards in effect before the Williams-Steiger Act was enacted consisted of relatively few specific safety rules, including a

standard for noise, threshold limit values for air contaminants, and adoption by reference of all standards approved by national consensus standards organizations or other organizations, as well as applicable Federal agency standards. This group of standards formed a major component of the initial standards package contained in 29 CFR Part 1910. This initial standards package consists of some 250 pages of the Federal Register and includes 66 ANSI standards, 19 NFPA standards, and 21 citations of established Federal standards (see table 1). For employers not previously covered (e.g. Walsh-Healey, Service Contract Act, etc.), a 90-day familiarization period was provided, with the standards becoming generally effective on August 27, 1971.

The standards of 29 CFR Part 1910 apply to all places of employment except mines and other places subject to the standards of other Federal agencies and are referred to as "horizontal" in that they are generally applicable to all industries. A few OSHA standards are applicable only to special industries such as sawmills, textile mills, and agricultural operations, and are called "vertical" standards.

Certain standards were delayed to enable employers and suppliers to order materials and to perform alterations or changes in installations and machinery to come into compliance with the standard. Additional delays in effective dates were allowed for electrical installations, major physical alterations such as ventilation systems, and certain types of machinery safeguarding which involved design and manufacture of guards.

## MARITIME

Safety and health regulations for longshoring, ship repair, shipbreaking, and shipbuilding as well as gear certification regulations had been issued under the Maritime Safety amendments of 1958 to the Longshoremen's and Harbor Workers' Compensation Act years before the Williams-Steiger Act was passed. Incorporated by reference when the initial standards package was adopted under the Act, these were originally in 29 CFR Part 1501–1505 and are now in 29 CFR Part 1915–1919. During 1971, the following was accomplished with regard to maritime standards:

- Amendments to 29 CFR Part 1504, Safety and and Health Regulations for Longshoring, were promulgated on May 28, 1971.
- New, all-inclusive dockside standards for marine terminal facilities are being developed by a reestablished ANSI committee on MH-9, "Safety Standards for Marine Terminal Operations Ashore."

**TABLE 1**

**PARTICIPANTS IN THE DEVELOPMENT OF STANDARDS INCORPORATED IN 29 CFR PART 1910**

**I. THROUGH NATIONAL CONSENSUS ORGANIZATIONS, EITHER THE AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI) OR THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

AAI—Agricultural Ammonia Institute
ACGIH—American Conference of Governmental Industrial Hygienists
AMO—Air Moving and Conditioning Association, Inc.
API—American Petroleum Institute
ASAE—American Society of Agricultural Engineers
ASHRE—American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
ASME—American Society of Mechanical Engineers
ASTM—American Society for Testing and Materials
AWS—American Welding Society, Inc.
CGA—Compressed Gas Association, Inc.
CMAA—Crane Manufacturers Association of America (formerly Electric Overhead Crane Institute)
IME—Institute of Makers of Explosives
IPM—International Association of Plumbing and Mechanical Officials
NEMA—National Electrical Manufacturers Association
NPF—National Plant Food Institute
SAE—Society of Automotive Engineers, Inc.
UL—Underwriters' Laboratories, Inc.
USPC—United States Pharmacopoeial Convention

**II. THROUGH FEDERAL AGENCIES**

AEC—Atomic Energy Commission
ESA—Employment Standards Administration, Labor
FAA—Federal Aviation Administration, Transportation
FSS—Federal Supply Service, General Services
HMRB—Hazardous Materials Regulations Board, Transportation
NBS—National Bureau of Standards, Commerce
OSHA—Occupational Safety and Health Administration, Labor
USCG—U.S. Coast Guard, Transportation
USDA—United States Department of Agriculture
USPHS—U.S. Public Health Service, HEW

- Development started on a comprehensive regulatory safety standard for marine terminal facilities for proposal and promulgation under section 6(b) of the Act in the event that ANSI MH–9 (under development) becomes delayed or is found inadequate.
- In cooperation with the National Fish Meal and Oil Association, a standard was developed for unloading menhaden fishing vessels, both aboard the vessel and at the terminal. Material provided for MH–9 was incorporated into standby regulatory proposals under the development.
- In conjunction with the American Tobacco Association and the Department of Agriculture, a standard covering carriage of containerized fumigated tobacco was developed for inclusion in future longshore regulations.
- The gear certification program and the accreditation of agencies authorized to do cargo gear survey work, including cranes, was continued.
- Technical aid, advice, and assistance was carried out by the Department on a continuing basis to unions, industry, and associations to help them come into compliance and eliminate hazards.

## CONSTRUCTION

In 1969, the Construction Safety amendments to the Contract Work Hours and Safety Standard Act were enacted, affecting Federal and certain federally assisted construction contracts. Under this Act, the Construction Safety Advisory Committee was appointed to aid the Department in developing appropriate standards for the construction industry. These standards were adopted as 29 CFR Part 1518 (now 29 CFR Part 1926) in April 1971 and were incorporated by reference to affect all construction covered by the Williams-Steiger Act under the initial standards package adopted in May 1971. The effective date of the standards for light residential construction was delayed until September 27, 1971, to allow for a period of familiarization and an opportunity for public comments.

Also in September, 41 amendments to the construction standards were proposed in the Federal Register. These proposals ranged from medical services to demolitions. Public hearings were held in November, resulting in a number of suggestions for changes or modifications.

Two subcommittees were appointed by the Construction Safety Advisory Committee to deal with special topics. The first dealt with rollover protective structures for construction vehicles (ROPS). Proposed standards were published in the Federal Register on October 29, 1971, and public hearings were held on December 13, 1971. Because of the highly technical questions raised at the hearings, the public was given an additional 30 days to make comments for the record. The second subcommittee worked on proposed amendments to the standards dealing with power transmission and distribution lines. These will be reviewed by the Construction Safety Advisory Committee during its first meeting in 1972. The Advisory Committee has also been asked to appoint a third subcommittee to reexamine the standards dealing with tunneling in the wake of the two major construction tunneling disasters in 1971 in Sylmar, Calif., and Port Huron, Mich.

## AGRICULTURE

Prior to the Williams-Steiger Act, there were practically no Federal occupational safety and health standards for agricultural workers other than the child labor and farm labor housing regulations. In recognition of this and the complex nature of the many employment situations in agriculture, only those specific standards having direct application to farm operations were made applicable in the initial standards package. However, because of the very high injury experience in agriculture and the use of highly toxic substances, including pesticides, priority is being given to developing new standards and reviewing existing ones so that more agricultural hazards will be covered.

To aid in this effort, a special Agricultural Advisory Committee is planned to work with the Labor Department, the Department of Agriculture (which has appointed its own special committee), and others in ensuring complete protection for farm employees. Among its first tasks will be reviewing the two existing departmental standards for migrant labor housing and developing standards dealing with tractors and pesticides.

## VARIANCES AND PETITIONS

The Act provides that employers may apply for temporary variances from the standards under section 6(b)(6) and permanent variances under

section 6(d), as well as variances for national defense purposes under section 16. Procedural rules for applying for such variances and provisions for the issuance of interim orders pending consideration of applications for variances were published in the Federal Register on June 30, 1971, in 29 CFR Part 1905.

The Department had received 108 variance applications by the end of 1971. A few applications were received prior to promulgation of the procedural rules (29 CFR Part 1905), with an increasingly larger number arriving during the 90-day familiarization period. About 30 applications had been received by August 27, 1971, when many of the standards became effective. Nearly two-thirds of these were concerned with the construction standards, most specifically the requirement for boom angle indicator and load indicating devices on cranes and derricks.

Approximately one-third of these applications have been disposed of, with most of the remainder held in abeyance pending the making of proposed changes in the construction standards. Many other applications were found not meeting the requirements of the regulations and were returned without prejudice to future disposition. The procedural rules require that a notice of filing of an adequate application be published in the Federal Register. Only two requests have resulted in such notices. The rate of application for variances has continued to increase, and it is anticipated that this trend will continue in 1972.

Interested persons may also petition for the promulgation, modification, or revocation of a standard under the rules promulgated in 29 CFR Part 1911 on September 1, 1971. A total of 45 petitions had been received by the end of 1971. Several of these apparently resulted from misinterpretation of the standards and the petitioners were so advised. It is also anticipated that the rate of petitions being received will continue to increase.

## IMPROVED STANDARDS COVERAGE

A review of the initial standards package disclosed some gaps and the Department is working to close them. OSHA compliance officers are trained to report such gaps in standards protection when encountered. Most current standards deal with safety matters, with much remaining to be done in the health area. In addition, there are some differences between the OSHA standards for general application and for similar work in the construction and maritime industries. While the Department is responsible for drafting, proposing, and analyzing public comments, and finally issuing new standards, assistance is provided in applied research by NIOSH and by national consensus organizations. A computerized system is being developed for storing and retrieving information required in standards development, including the abstracting of foreign and domestic technical publications and data relating to standards.

ANSI and NFPA were the only two national consensus organizations recognized in the calendar year, though other organizations in the future may gain recognition under the procedures prescribed in 29 CFR Part 1910.3. These two organizations are working on new and revised standards developed by their technical and standards committees. Efforts are increasing to develop more and better standards. Nonconsensus standards being developed by professional societies and other organizations are under consideration for processing as future Federal standards under the provisions of section 6(b). The OSHA staff has informed NFPA and ANSI of standards needs, and has discussed with them their plans for development of new standards or modifications of existing ones.

A major effort is under way by the Department and NIOSH to identify and evaluate those factors which historically have caused the highest number of injuries, illnesses, and fatalities. In the safety area, some of the known areas of need include:

—Agricultural operations
—Fire protection systems
—Construction sites and equipment certification
—Maritime dock safety and crane certification
—Machinery equipment
—Plant layout and physical environment
—Heat stress, ventilation, illumination, personal protective equipment, and hazardous material labeling
—Materials handling
—Electrical systems

With regard to health, NIOSH has identified more than 8,000 substances in the Toxic Substance List published in 1971. About 500 of these are now covered by OSHA standards. It is estimated that an additional 500 to 600 new substances that may be toxic or involve long-term, undetermined haz-

ards to employee health are introduced into industry yearly. A key step in handling this problem to be implemented next year is the development of labeling and materials handling requirements as required by section 6(b)(7) of the Act. Although various labeling insignia exist, these most generally are keyed to the avoidance of a hazard rather than to the precautions that should be taken to protect employees whose duties necessitate such exposure. The need for uniform labeling criteria will be accentuated by the entrance of additional States into the occupational safety and health field.

As part of the effort to develop new and improved standards, studies are being planned to evaluate the degree of compliance and estimate the impact of inspection and enforcement activity undertaken. The first study is designed to measure the impact of the program upon affected establishments in terms of the direct economic consequences, safety improvement, social and other possible impact of the Act. Other studies will be conducted for new standards to determine possible socioeconomic impact or the cost benefit of such standards, as additional criteria for the standards-setting process. OSHA's concern for the feasibility of occupational safety and health standards from the outset is reflected in the regulations and standards issued so far, many of which allow employers needed time to purchase equipment, make alterations, and otherwise come into compliance.

## Chapter 4

# COMPLIANCE OPERATIONS

While the purposes of the Occupational Safety and Health Act cannot be achieved without voluntary compliance by employers and employees, it is equally necessary that a program of enforcement activity be implemented. The Act spells out in detail the powers of the Secretary to enforce the standards and regulations issued. These include the power to make inspections and investigations of any covered workplace, to propose penalties for alleged violations, to require records be kept and made available, to seek injunctive relief in the courts in imminent danger cases, and to protect employees from discrimination because of the exercise of rights under the Act.

Federal inspection and related compliance activities are carried out through 10 regional offices, 49 area offices, and 2 maritime district offices located in major cities. Regional Administrators are directly responsible for operations in multi-state regions. Inspections are conducted by compliance safety and health officers (CSHO's) and industrial hygienists (IH's)—experts in the field of hazard recognition and control—under the general supervision of Area Directors who schedule and coordinate compliance activities and provide technical and administrative support. Not only has the OSHA compliance staff been rapidly expanded, but State compliance programs have been preserved by the signing of agreements under section 18(h) of the Act, and State compliance personnel have been used directly in the Target Industry Program.

## SUMMARY OF COMPLIANCE ACTIVITIES

Investigation and inspection activity began immediately after the Act became effective on April 28, with the first citation issued and the first penalty proposed in May. The citation was issued under the general duty clause (section 5(a)(1)) of the Act, which requires employers to maintain their workplaces free from recognized hazards that are causing or are likely to cause death or serious physical harm to employees. Under Department of Labor policy, citations are issued under this clause only for serious violations and when no specific standard is applicable to the hazard involved. During the period prior to the end of the 90-day familiarization period for the initial standards on August 27, compliance activities in newly covered establishments were limited to investigations of catastrophes, fatalities, and valid employee complaints. However, for establishments previously covered under other Federal statutes, such as those for the maritime and construction industries, a regular inspection program took place.

The regular compliance program became effective on August 27. The following priorities are applicable to investigation and inspection activity:

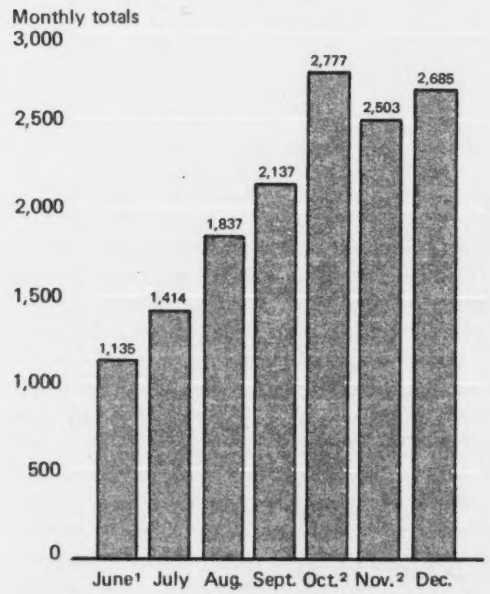
1. Catastrophe and/or fatality investigation;
2. Investigations based on valid complaints;
3. Special hazard elimination programs (see Chapter 7);
    a. Target Industry Program
    b. Target Health Hazard Program
4. General inspections on a random-selection basis of all industries and sizes of establishments in all parts of the country.

Operating under these priorities, 14,452 investigations and inspections were made through December 31. The rate of making inspections increased during the year as more experience was gained and new compliance officers and industrial hygienists were recruited and trained (see Charts 5 and 6). Without taking into account recent and projected staff increases, an annual rate of about 35,000 inspections had been achieved by the end of the year. In the establishments inspected, which em-

CHART 5

***OSHA National Summary***

**Inspections: Monthly, All Programs, 1971**




Note: State TIP inspections and accident and complaint investigations are included in the totals.

[1] June data include activities beginning April 28, 1971.

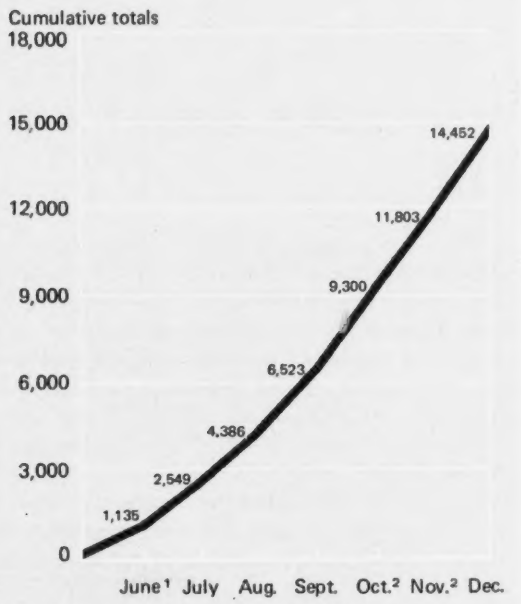
[2] October totals cover a 5-week period, and November a 4-week period; however, the weekly average number of inspections in November increased over October.

Source: Department of Labor.

CHART 6

***OSHA National Summary***

**Inspections: Cumulative Totals, All Programs, 1971**




Note: State TIP inspections and accident and complaint investigations are included in the totals.

[1] June data include activities beginning April 28, 1971.

[2] October totals cover a 5-week period, and November a 4-week period; however, the weekly average number of inspections in November increased over October.

Source: Department of Labor.

ployed nearly 2.5 million persons, 35,839 violations were alleged resulting in 9,507 citations being issued (see Charts 7 and 8). Penalties were proposed amounting to $737,486.

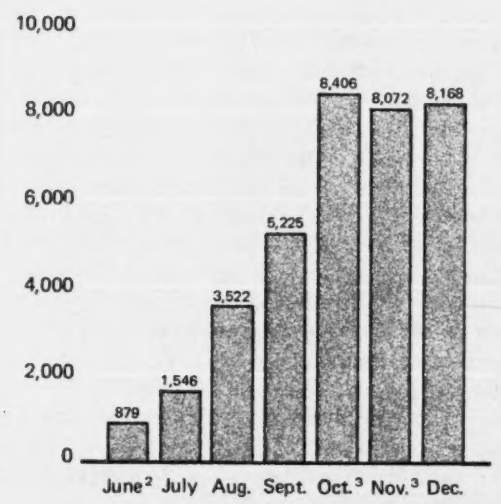
During this period, 1,169 complaints were received from employees or their representatives, more than half of which were concerned with health problems. Complaint investigations are scheduled as soon as an evaluation of a complaint indicates that there is reasonable cause to believe that a violation exists. There was, as of year end, no backlog of unserviced complaints. The rate of complaint inflow began to rise dramatically by the end of the year with 288 received in November and 315 in December, or 52 percent of the total in the last 2 months.

Once an inspection is completed (See "Inspection Procedures", p. 24) and an apparent violation disclosed, a citation is issued along with proposed penalties, if any. An employer has 15 working days from the time he receives the notice of the proposed penalty to file a notice of contest requesting a hearing. The employer may contest the issuance of the citation, the application of the standards, the length of the period of abatement, and/or the amount of any proposed penalty. Employees may contest the abatement period as being unreasonable. The Department of Labor then transmits the notice of contest to the Occupational Safety and Health Review Commission. If no notice of contest is filed within the 15-day period, the Secretary's citation and any proposed penalty become a final order of the Commission and nonreviewable. In those instances when there has been a failure to abate, in accordance with the requirements covering an uncontested citation or a citation affirmed by the Review Commission, a notice of additional proposed daily penalties may be issued as authorized by section 17(d) of the Act. In addition, final

CHART 7

***OSHA National Summary***

**Violations[1] Alleged: Monthly, All Programs, 1971**




[1]De minimus notifications not included.

[2]June data include activities beginning April 28, 1971.

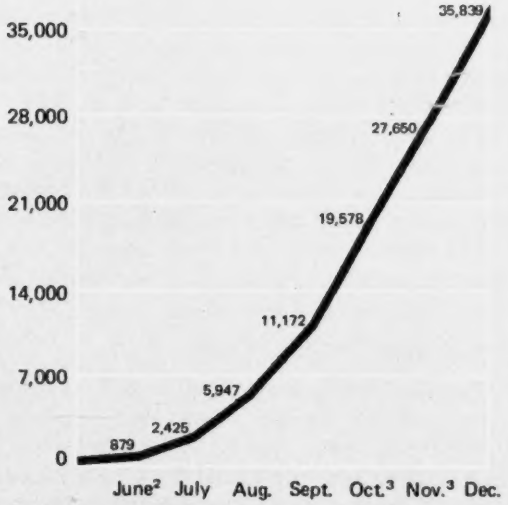
[3]October totals cover a 5-week period, and November a 4-week period; however, the weekly average number of violations in November increased over October.

Source: Department of Labor.

CHART 8

***OSHA National Summary***

**Violations[1] Alleged: Cumulative Totals, All Programs, 1971**




[1]De minimus notifications not included.

[2]June data include activities beginning April 28, 1971.

[3]October totals cover a 5-week period, and November a 4-week period; however, the weekly average number of violations in November increased over October.

Source: Department of Labor.

orders may be enforced, if necessary, by proceedings in an United States Court of Appeals.

## CONTESTED CASES—THE OCCUPATIONAL SAFETY AND HEALTH REVIEW COMMISSION

The Occupational Safety and Health Review Commission assigns a hearing examiner to conduct a public hearing in all contested cases. After the hearing, the examiner must issue an order based on findings of fact affirming, modifying, or vacating the Secretary's citation or proposed penalty, or directing other appropriate relief, and his order will become final 30 days thereafter unless, within such period, any Commission member directs that such report shall be reviewed by the Commission itself. Of 9,507 citations issued during 1971, there had been only 358 notices of contest filed with the Commission. Of that number, 22 cases had been withdrawn on motion of the parties; 60 had been dismissed by the Commission for procedural reasons; 130 had been assigned for hearings; and the remainder were awaiting assignment to a hearing examiner. The monthly breakdown of contests filed during 1971 is as follows:

| | |
|---|---|
| April | 0 |
| May | 0 |
| June | 1 |
| July | 11 |
| August | 15 |
| September | 33 |
| October | 69 |
| November | 103 |
| December | 126 |
| Total | 358 |

As these figures indicate, the number of contests filed per month accelerated rapidly during the



457-200 O - 72 - 3

year. This parallels the increase in the number of citations issued during the same period as enforcement of the Act was broadened.

In addition, any party—the employer, the Secretary, or the employees if they have contested the abatement period—may file a request within 30 days for discretionary review by the Commission. Of the 26 cases decided by hearing examiners by the end of the year, five became final since no review was requested or directed; 10 cases directed for review by a Commission member were yet to be decided; and in 11 cases, the hearing examiner's decision had been pending less than 30 days.

The "due process" features of the Act do not stop with a Commission decision. Section 11 provides that the Secretary or adversely affected or aggrieved persons may seek judicial review of the Commission's order in the appropriate United States Court of Appeals. As of December 31, 1971, no such appeals had been filed.

## INSPECTION PROCEDURES

The Secretary has issued regulations on compliance procedures (29 CFR Part 1903). In addition, to inform the public on the Department's compliance activity and to guide OSHA's field organization, a Compliance Operations Manual was issued in April 1971, with a revised and more detailed edition issued in December. The manual was scheduled for public sale through the Government Printing Office early in 1972. To assure uniformity in compliance operations and to improve effectiveness, the scope of the manual is extensive. It is a dynamic document, subject to continual revision as the program develops and to reflect decisions of the Occupational Safety and Health Review Commission. It includes such topics as the planning and scheduling of inspections, post-inspection reports and records, citations, proposed penalties, and reinspections.

Section 17(f) of the Act contains a general prohibition against the giving of advance notice of inspections except as authorized by the Secretary or his designees. This prohibition is intended to avoid giving the employer an opportunity to make adjustments that would create a misleading impression of conditions in the establishment. However, there are occasions when advance notice is necessary to conduct an effective investigation. Accordingly, the regulations in 29 CFR Part 1903 spell out those instances when advance notice may be given, including such cases as apparent imminent danger to enable rapid abatement of the danger or when necessary to ensure that the processes or conditions to be inspected are actually in operation. When an employer is given advance notice, his employees are also entitled to this notice.

Section 8 of the Act provides that an inspector may at reasonable times enter without delay any workplace covered by the Act. In the overwhelming majority of cases employers have permitted inspection of their establishments. As of December 31, however, there have been three refusals of entry, one each in Michigan, Idaho, and New York. In all three instances, warrants were obtained from the courts to authorize conduct of the inspections.

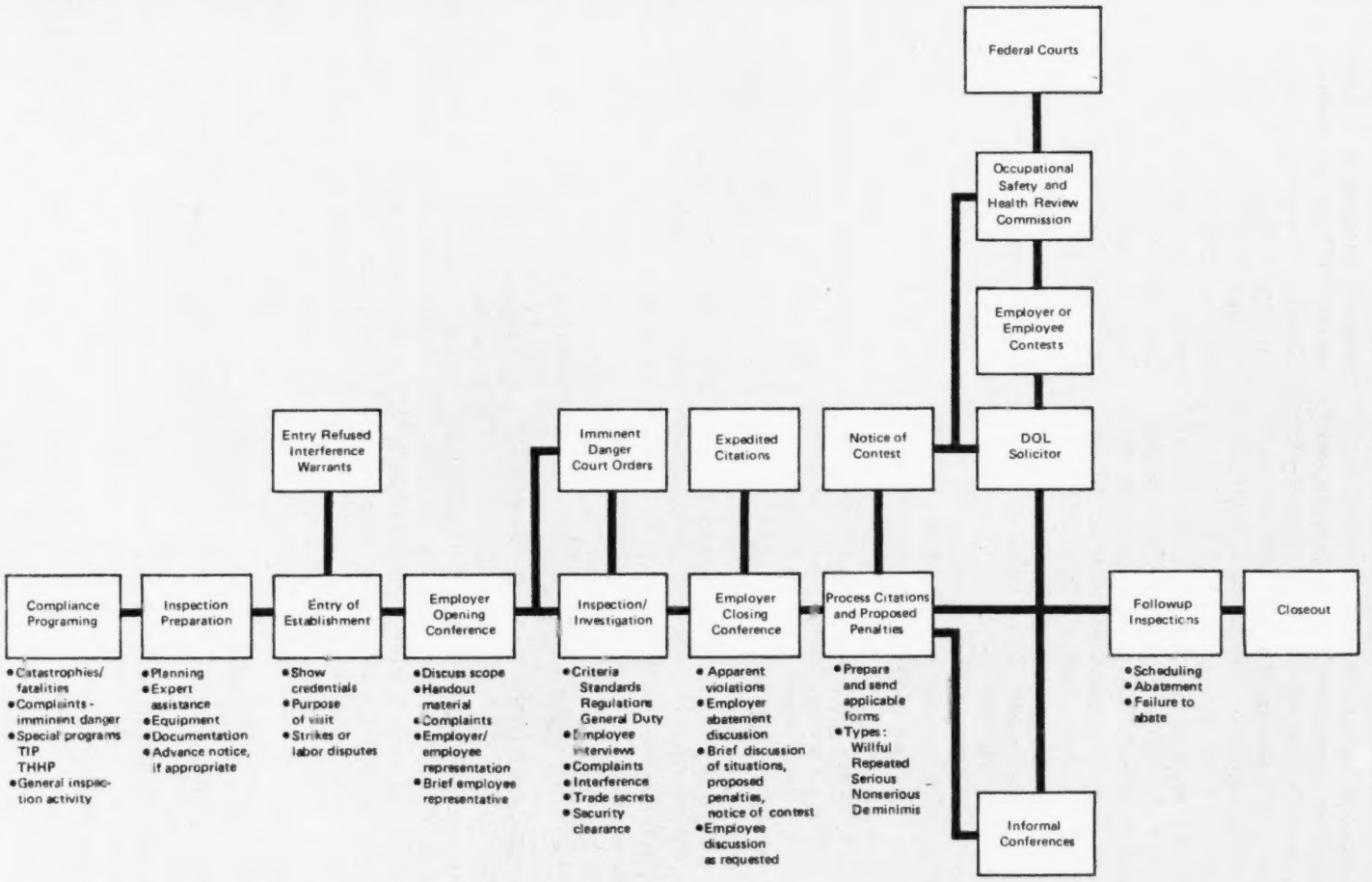
A major component of every inspection is the walkaround. Section 8(c) requires that a representative of the employer and of the employees be given an opportunity to accompany the compliance safety and health office during an inspection. This participation can aid greatly in identifying any hazards that may exist in the establishment. Section 8(e) provides that, in the absence of a recognized representative for employees, the compliance officer must and does consult with a reasonable number of employees on conditions in the establishment.

The inspection provides the compliance officer and industrial hygienist with five basic elements of on-the-scene reporting: (1) physical presence at the place of work; (2) observance of actual operations; (3) discussion of activities with both employer and employees; (4) on-site comparison of existing conditions with the standards; and, (5) identification of specific problem areas. Chart 9 shows the elements of an occupational safety and health inspection. Among the physical conditions examined are materials handling, equipment, work surfaces, work methods, personal protective equipment, medical and first aid capabilities, and supporting and housekeeping systems such as ventilation, illumination, fire protection, electrical, heating and cooling, noise control, sanitation, disposal, and storage.

Upon completion of an inspection, the compliance officer has a closing conference with the employer to advise him of all conditions or practices disclosed that apparently constitute safety or health violations, indicating the applicable sections of the standards involved. The employer is advised that citations may be issued with respect to some or all of the conditions noted and that

CHART 9

## Inspection/Investigation Flow Chart




Source: Department of Labor.

monetary penalties may be proposed. He is also told that any citation will fix a reasonable time for abatement of the alleged violation. Employers are encouraged to eliminate any and all hazards as soon as possible. Generally there will be no closing conference with the employees unless requested, since they will have participated in the inspection process.

Followup inspections are conducted to evaluate corrective action taken by employers with regard to hazards disclosed in the original inspection. Such inspections are mandatory in specific situations, including when a court has issued a restraining order in an imminent danger situation and when citations for serious, willful, or repeated violations have been issued.

As provided in section 15 of the Act, all information reported to or obtained by compliance staff in connection with any inspection or other activity which contains or which might reveal a trade secret must be kept confidential. A trade secret is any confidential formula, pattern, device, or compilation of information used in the employer's business that gives him an opportunity to obtain an advantage over competitors who do not know or use it. Similarly, when it is necessary for Departmental personnel to have access to classified security information, all documented data and personal knowledge of such data are handled in accordance with the security regulations of the responsible Federal agency involved.

## VIOLATIONS, CITATIONS, AND PROPOSED PENALTIES

Violations of the standards or regulations issued under the Act may take many different forms and may vary considerably in their gravity in terms of threatening the safety and health of employees. The Act contains a break-down of violations into a number of general categories. For purposes of issuing citations and proposing penalties and abatement periods, the Compliance Operations Manual contains specific guidelines to assist OSHA staff in determining the category of the violation. These categories are:

1. *Serious.* Section 17(k) defines a serious violation as one in which there exists a substantial probability that death or serious physical harm could result from the alleged violation and whether the employer knew or, with the exercise of reasonable diligence, should have known of the hazard. Guidelines have been established in the Compliance Operations Manual to aid in evaluating "substantial probability", "serious physical harm", and "employer knowledge".

2. *Willful and repeated.* A willful violation exists when the evidence shows either that the employer committed an intentional and knowing violation of the Act and the employer is conscious of the fact that what he is doing constitutes a violation, or, that even though the employer was not consciously violating the Act, he was aware that a hazardous condition existed and made no reasonable effort to eliminate the condition. It is not necessary that the violation be committed with a bad purpose or evil intent to be deemed willful. Repeated violations may be cited under section 17(a) when a second citation is issued for violations of the same standard, rule or order for which a previous citation was issued.

3. *Nonserious.* Nonserious violations are those which are not serious violations but which do have a direct or immediate relationship to occupational safety and health.

4. *De minimis.* A violation is considered de minimis when it has no immediate or direct relationship to the safety and health of the employees. No citation is issued for a de minimus violation.

Section 13 of the Act contains special enforcement provisions when an investigation discloses an imminent danger to employees. An imminent danger is defined as ". . . any conditions or practices in any place of employment which are such that a danger exists which could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such danger can be eliminated through the enforcement procedures otherwise provided . . ." In such cases, the Secretary is authorized to petition the appropriate United States District Court for a restraining order directed at requiring the employer to take such steps as are necessary to eliminate the imminence of the danger. These orders may prohibit employment in the area subject to the danger except those necessary to correct the danger. This provision was used as a basis for obtaining a temporary restraining order and a preliminary injunction in the aftermath of the Port Huron, Michigan, tunnel explosion in December that killed 22 employees.

Regulations issued under the Act require employers to take specific actions, including the posting of notices advising employees of their rights, all citations issued, and the annual summary of

occupational injuries and illnesses in the establishment; maintaining records and making reports, giving of advance notice of inspections to employees when he has received such advance notice; and, the reporting to the nearest OSHA office within 48 hours of the occurrence of any employment accident that is fatal to one or more employees or results in hospitalization of five or more employees. When an employer violates the requirements of the regulations, he is subject to citation and proposed penalties.

When a violation is disclosed, a citation is issued to the employer describing with reasonable particularity the alleged violation, including the kind of violation involved. No citation may be issued after the expiration of 6 months following the occurrence of any violation. As a general matter, all instances of the same violation of a single standard which are disclosed during an inspection of a single establishment will constitute one alleged violation.

Section 5(b) of the Act provides that each employee shall comply with all standards and regulations which are applicable to his own actions and conduct. However, the Act does not provide for the issuance of citations or proposed penalties to employees; employers are generally held responsible for hazardous conditions in the workplace even if resulting from employee actions. However, an employer continues to have the right to exercise normal disciplinary actions with regard to employees who violate safety or health requirements.

In issuing citations for alleged violations, OSHA also sets periods for the abatement of the violation. Except in unusual cases, the period for abatement will be less than 30 days. Where emergency modifications are required, the citation may enjoin interim abatement measures such as use of personal protective equipment and administrative controls. Penalties are proposed for alleged serious and nonserious violations disclosed during an initial inspection of up to $1,000 for each violation. In proposing penalties, the Secretary gives due regard to the gravity of the violation, the good faith of the employer, the size of the business, and the history of past violations. In the case of other than serious violations, penalties are optional and the employer receives a credit of 50 percent in the proposed penalty if the alleged violation is abated within the period set forth in the citation. To assure uniformity of application in proposing penalties, the Compliance Operations Manual contains detailed written guidelines on the calculation of the amount of penalty to be proposed for each type of violation. No penalties are proposed for de minimis violations.

Consistent with the mandate of the Act, the Department proposes substantially greater penalties for violations not abated after a citation has been issued than for violations disclosed during an initial inspection. When an employer who has not filed a notice of contest does not abate a violation within the period set forth in the citation, the Act authorizes *daily* penalties of up to $1,000. This approach is designed to provide a strong incentive for employers to promptly eliminate from the workplace hazardous conditions which were the subject of the citation. However, in cases contested by the employers in good faith and not solely for delay or avoidance of penalties, the time for abatement does not begin to run until the date of the final order of the Review Commission.

## Chapter 5

# TRAINING AND EDUCATION

The Congress, in enacting the Williams-Steiger Occupational Safety and Health Act of 1970, recognized the necessity for providing countermeasures that could be applied to the man as well as the machine and the environment. This human aspect is being cared for through training and education efforts directed toward both the employer and the employee.

Section 21(c) of the Act states that the Secretary of Labor, in consultation with the Secretary of Health, Education, and Welfare:

> shall (1) provide for the establishment and supervision of programs for the education and training of employers and employees in the recognition, avoidance, and prevention of unsafe or unhealthful working conditions in employments covered by this Act, and (2) consult with and advise employers and employees, and organizations representing employers and employees as to effective means of preventing occupational injuries and illnesses.

Section 21(b) of the Act authorizes the Secretary of Labor to conduct, directly or by grants or contracts, short-term training for personnel engaged in work related to his responsibilities under this Act. Various standards issued under the Act require employers to train employees in job safety and health practices. A specific group of such requirements is in 29 CFR Part 1926.21 of the construction standards. Most of these standards refer to the general application of safety practices in construction work. Other standards requiring employers to provide employee training in safety and health are found in several parts of the safety and health standards published on May 29, 1971, such as the requirement that employees be instructed in the proper use of respirators (29 CFR Part 1910.134(b)).

The training strategy being implemented by the Department is shown in Chart 10. It consists of three major elements: (1) determining training requirements, (2) developing training program materials to fulfill these requirements, and (3) delivering these training programs to the target populations by using the services of Department personnel in Washington and in the field, occupational safety and health personnel of appropriate State agencies, employee organizations, trade associations and other groups representing employers, and by using the resources of both public and private formal educational institutions.

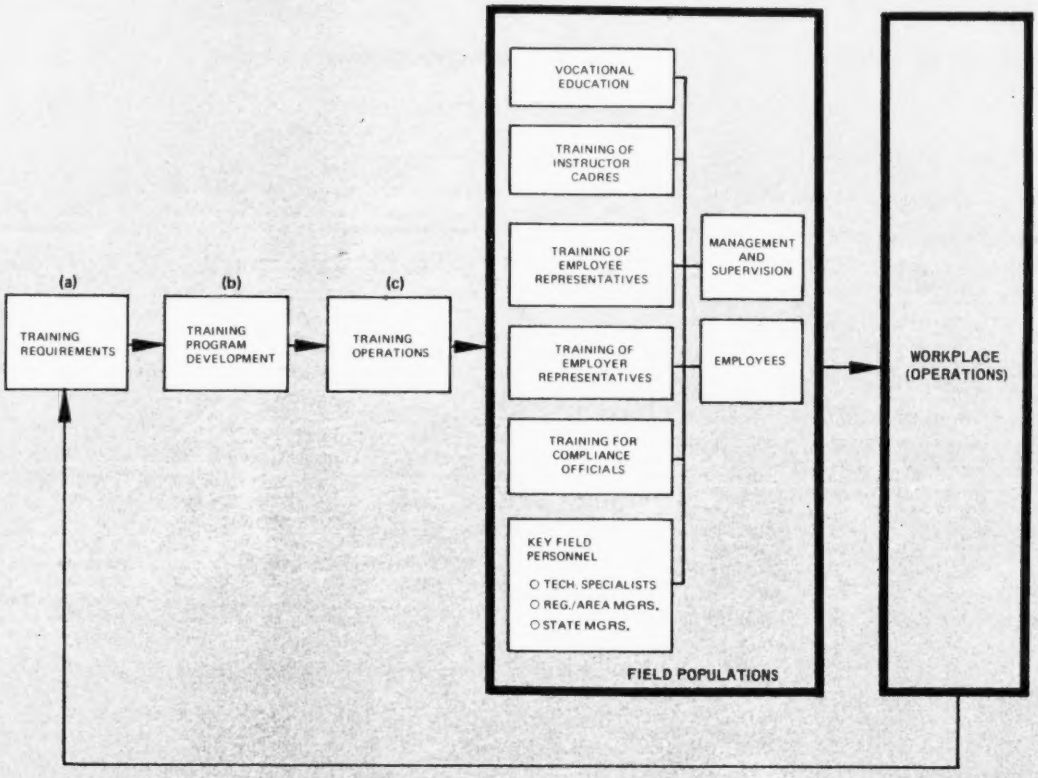
With some 60 million covered employees as the approximate target population for training efforts, it is necessary to utilize fully the capabilities of these individuals and organizations. The Department will never be able to directly reach all covered employees and employers. Therefore, another major element in the training strategy is to find ways of maximizing the outreach of the training it provides for employee representatives and representatives of employers through a "multiplier" effect. An example of how this is being achieved is the construction industry instructor course described in this chapter.

As with any task the size of that faced by the Department in implementing the training requirements of the Act, it is necessary to establish priorities to the many training tasks waiting to be accomplished. Following are the training priorities identified and the accomplishments within each category during 1971.

A well-qualified force of compliance personnel in the field to enforce the safety and health standards promulgated by the Secretary and to provide consultative services to employers is requisite to the success of the Act. Accordingly, the Department moved to instruct both its own compliance safety and health officers (CSHO's), industrial hygienists (IH's), and inspectors from those eight States (California, Florida, Illinois, New York,

CHART 10

**The Training and Education Function in a Systems Context**




Source: Department of Labor.

North Carolina, Oregon, Pennsylvania, and Washington) with which it had negotiated section 7(c)(1) agreements to make inspections in the target industries.[1] These courses consisted of 3 to 5 weeks of intensive training in OSHA standards and compliance procedures. Instructional methods consisted of a combination of lectures, team teaching, demonstrations, practical exercises, case studies, role playing, field visits, and group discussion. Extensive use was made of visual aids, including videotape. The field visits included both the area offices out of which compliance officers operate and actual workplaces where trainees observed procedures employed by senior compliance officials. A total of 14 classes for 344 compliance safety and health officers who would be working almost exclusively in the area of construction were given added specialized training.

Of equal importance to the training of compliance personnel in the field was instruction of key national office personnel, Regional Administrators and Area Directors and their staffs. In addition to courses in the management aspects of the OSHA program, many national, regional and area office personnel completed the training program designed for compliance officers so they would have a fuller understanding of the compliance process and thus be able to support compliance officers in the field more effectively.

The first major use of the multiplier principle to reach covered employers and employees was in the construction industry, in which a series of 35 instructor-training sessions was held to train a

[1] The Secretary is authorized by section 7(c)(1) to enter into agreements with the States for the use of their personnel and facilities.

CHART 11

**Locations of 35 Instructor Training Sessions in 1971 for the Construction Industry**

Source: Department of Labor.

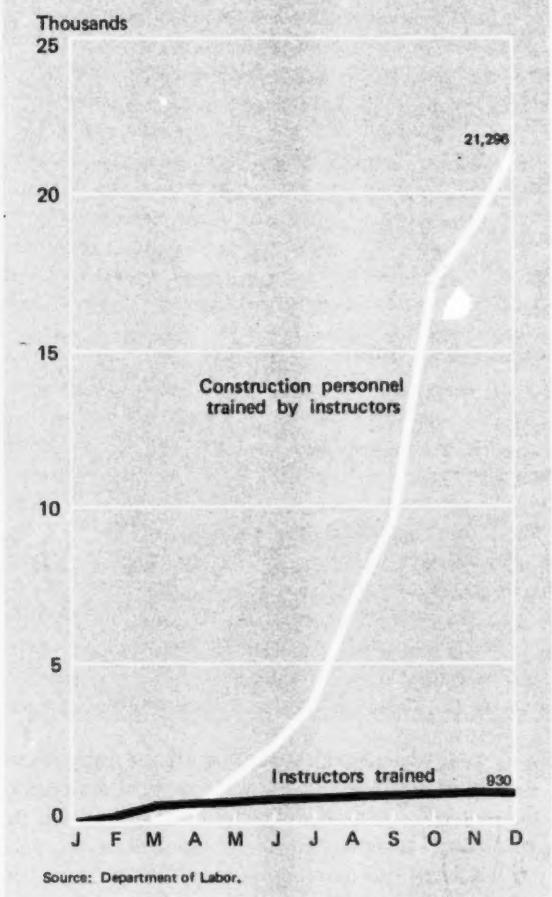
cadre of instructors who could then return to their places of work and present modified versions of the training to management and to supervisors. Chart 11 shows the locations of these instructor-training sessions. The 930 personnel who completed the instructor training were provided with training course outlines and training aids. As of December 31, 1971, as shown in Chart 12, these 930 instructors had reached out to present training to 21,296 persons at the construction jobsite. There is every indication that the outreach for this training will continue at an accelerated pace. Other such training efforts are planned for 1972.

Another training activity high on the Department's priority list is that of alerting employees to their rights and responsibilities under the Act. Employees need to know where and how they fit into the implementation of the Act. As a starting point in this program, the Department contracted for a total of thirty 1-day orientation sessions for employee representatives. Each attendee received pertinent information, a teaching outline, a manual, and training aids that could be reproduced locally at low cost. In turn, he was encouraged to present the orientation to fellow employees at the worksite. The locations of the orientation sessions, which were attended by some 2,100 persons, are shown in Chart 13. From the inquiries generated by these sessions, there is good reason to believe that the project is achieving its intended purpose of getting key information on the Act to employees at the jobsite.

An important part of OSHA's program for training and education is the dissemination of news and other information to the general public, to employers and employees, to trade and similiar associations, labor organizations and the like. This function is carried out through distribution to the news media of press releases and other relevant materials; through announcement of insertions in the Federal Register concerning OSHA rules, regulations, and statements of policy; through speeches and related public appearances; through exhibits at conventions; through *Safety Standards*, the offi-

CHART 12

**Outreach of Training Services by Those Trained As Instructors, 1971**




Source: Department of Labor.

cial magazine of the Occupational Safety and Health Administration; and through a variety of pamphlets and other publications designed to inform and educate employers and employees on implementation of specific portions of the Williams-Steiger Act. The magazine *Safety Standards* has been upgraded and its circulation more than tripled.

The Department of Labor collaborated with the National Association of Manufacturers in its sponsorship of a closed-circuit, videotaped television broadcast explaining the Act. More than 10,000 business representatives in 27 cities viewed the program, the largest audience ever for a presentation of this kind. Kinescopes of selected portions of this 5-hour telecast have been used extensively.

Television and radio public service announcements, for which networks and stations contribute free air time, are being broadcast widely. Twenty-five radio spots started during the summer, followed by three TV spots in early autumn. A survey was conducted to evaluate the effectiveness of various methods of communicating with and motivating employers and employees in on-the-job safety and health. During the winter, another 24 radio spots and six TV spots were distributed. In addition, slides with live narration were sent to 700 stations and are being used in most of the States.

Based on rough estimates, approximately 150,000 written communications, 240,000 incoming telephone calls, and 40,000 visits to OSHA offices occurred during the July–December 1971 period. In the same period, OSHA officials appeared before about 5,000 business, union, government, and other interested groups. This activity continues at an accelerated pace.

In an effort to reach even larger numbers of those affected by the Act, the Department is sponsoring the development of programed instructional materials on the safety and health standards for use by foremen. The Department is also cosponsoring with the National Institute for Occupational Safety and Health (NIOSH) a correspondence course on occupational safety and health. The National Safety Council is working with OSHA to develop accounting methods to show the benefits of good industrial safety and health programs and a self-inspection guide for industry.

A training facility, the plans for which were developed during the year, will open in January 1972, in Rosemont, Ill., near Chicago. The Training Institute will train 31 classes of 30 students each during 1972 in courses that will include:

- A 4-week comprehensive training course for new OSHA and State compliance inspectors.
- A 2-week refresher course for all current OSHA compliance inspectors.
- A 4-week comprehensive training course for OSHA industrial hygienists.
- A 1-week refresher/training course for OSHA compliance inspectors who work solely with maritime activities.
- A 1-week refresher/training course for OSHA compliance inspectors who devote all or much of their inspection effort to construction.

- Twelve 40-hour courses to train a cadre of industry representatives who will later instruct employees in the construction industry (three additional courses will be conducted in Alaska, Hawaii, and Puerto Rico).
- Several courses for selected persons from OSHA national, regional, and area offices.

The institute is being operated on an experimental basis to determine whether this method for offering training to the populations affected by the Act is a viable delivery system for the types and volume of training needed to meet the Department's responsibilities under the Act.

CHART 13

**Locations of 30 Orientation Sessions in 1971 on the Occupational Safety and Health Act for Employee Representatives**

Source: Department of Labor.

The Act assigns training responsibilities to both the Department of Labor and to the Department of Health, Education, and Welfare through NIOSH, and close coordination is essential. NIOSH has developed and conducted courses for Department of Labor compliance safety and health officers and for technical support personnel in Washington and in the field. Specific examples are the "Laboratory Orientation for OSHA Industrial Hygienists" course designed to acquaint OSHA industrial hygienists with the NIOSH laboratory at Salt Lake City, Utah, where they send their field samples for chemical analysis, and "Orientation in Occupational Health for Compliance Safety and Health Officers" in the fundamental principles of industrial hygiene and the procedures used to recognize and evaluate occupational health hazards.

NIOSH also has cosponsored the development of occupational safety and health training programs with the Department, and departmental personnel serve on the NIOSH training advisory committee which evaluates applications from colleges and universities for training grants to prepare professional manpower in occupational safety and health.

To assist in meeting the need for personnel trained in first aid, the Secretary of Labor and the president of the American National Red Cross

finalized an agreement in December 1971, in which the Department recognizes that persons who have a current training certificate in the Red Cross standard, advanced, and basic first aid courses shall be considered as adequately trained to render first aid in fulfilling the requirements of the occupational safety and health standards. The agreement also provides that:

- The Department will advise States developing or implementing a State plan under the Act that persons who have a current Red Cross first aid certificate meet the training requirements set forth in the standards.
- The Department will direct Regional Administrators to develop and maintain liaison with Red Cross area offices.
- The Red Cross will develop guidelines for use by Red Cross operational units to expand first aid training resources and will continue to adapt courses to meet the needs of different work environments.
- The Red Cross will have its chapters, divisions, and areas assist in distributing information relating to first aid training services available to employers and employees.
- The Red Cross will designate liaison personnel to work with the national office and the Regional Administrators of OSHA.
- The Red Cross will provide OSHA with pertinent information regarding its training efforts, and with information necessary for the review of its training courses, as requested.

This endorsement of Red Cross training and certificates is not exclusive and the Department will recognize at the regional level such other first aid courses as it finds satisfactory.

## Chapter 6

# ROLE OF THE STATES

Prior to the passage of the Occupational Safety and Health Act, most of the responsibility for protecting workers' safety and health rested with the States. Thus, the Act poses a significant challenge for States having their own occupational safety and health programs; as the Department of Labor issues standards, the enforcement authority of the States is preempted in areas covered by those standards unless the States cooperate with the Federal programs. The purpose of the Act is not to eliminate State safety and health programs but to include the States as major participants in the implementation of the Act as clearly stated in the "Congressional Findings and Purposes":

> . . . to assure so far as possible every working man and woman in the Nation safe and healthful working conditions . . . by encouraging the States to assume the fullest responsibility for the administration and enforcement of their occupational safety and health laws. . . .

This general endorsement of a full partnership with the States is given definition in later sections of the Act. The major vehicle for State involvement is a State plan. Basically, a State plan is an occupational safety and health program that must be, both in writing and in operation, "at least as effective as" the Federal program. The general parameters of State plans are described in section 18 of the Act.

Thus, the States are faced with a choice. They can either accept gradually expanding Federal preemption or they can develop and submit a plan that will enable them over time to replace the Federal safety and health effort with their own program.

To assist the States in the development of acceptable plans, the Act provides several intermediate steps:

1. The Governors of all States and territories were invited to designate an agency (or agencies) to work with the Department in developing a cooperative Federal-State relationship.

2. Section 18(h) agreements give temporary protection against Federal preemption for those States interested in developing a plan.

3. Section 23(a) provides substantial planning grant assistance for development of plans.

4. Section 23(b) provides grant assistance for experimental and demonstration projects.

5. Section 23(g) gives further assistance to States with plans; once a plan is approved, a State can receive up to 50 percent funding by the Federal Government.

6. Section 24 provides for grant assistance to the States to develop and administer programs dealing with occupational safety and health statistics.

Table 2 Summary of State Activity—1971

| State | Formal written statement of intent to submit a State plan | Section 18(h) agreement | Section 23(a) grant | Section 7(c)(1) agreement under Target Industry Program |
|---|---|---|---|---|
| Alabama | × | × | × | |
| Alaska | × | × | × | |
| American Samoa | | | (1) | |
| Arizona | × | × | × | |
| Arkansas | × | × | × | |
| California | × | × | × | × |
| Colorado | × | × | × | |
| Connecticut | × | × | × | |
| Delaware | × | × | × | |
| District of Columbia | × | × | × | |
| Florida | × | × | × | × |
| Georgia | × | × | × | |
| Guam | × | × | | |
| Hawaii | × | × | × | |
| Idaho | × | × | × | |
| Illinois | × | × | × | × |

See footnote at end of table.

Table 2 Summary of State Activity—1971—Continued

| State | Formal written statement of intent to submit a State plan | Section 18(h) agreement | Section 23(a) grant | Section 7(c)(1) agreement under Target Industry Program |
|---|---|---|---|---|
| Indiana | × | × | × | |
| Iowa | × | × | × | |
| Kansas | × | × | × | |
| Kentucky | × | × | × | |
| Louisiana | × | × | × | |
| Maine | × | × | × | |
| Maryland | × | × | × | |
| Massachusetts | × | × | × | |
| Michigan | × | × | × | |
| Minnesota | × | × | × | |
| Mississippi | × | × | × | |
| Missouri | × | × | × | |
| Montana | × | × | × | |
| Nebraska | × | × | × | |
| Nevada | × | × | (1) | |
| New Hampshire | × | × | × | |
| New Jersey | × | × | × | |
| New Mexico | × | | × | |
| New York | × | × | × | × |
| North Carolina | × | × | × | × |
| North Dakota | × | × | × | |
| Ohio | | | (1) | |
| Oklahoma | × | × | × | |
| Oregon | × | × | × | × |
| Pennsylvania | × | × | × | × |
| Puerto Rico | × | × | × | |
| Rhode Island | × | × | × | |
| South Carolina | × | × | × | |
| South Dakota | × | | | |
| Tennessee | × | × | × | |
| Texas | × | × | × | |
| Utah | × | × | × | |
| Vermont | × | × | × | |
| Virgin Islands | × | × | | |
| Washington | × | × | × | × |
| West Virginia | × | × | × | |
| Wisconsin | × | × | × | |
| Wyoming | × | × | × | |

[1] Application has been submitted; is in approval process.

Table 2 summarizes the activities during 1971 of these provisions of the Act.

Although a State plan is the major vehicle for State participation under the Act, an additional means is provided by the general agreement authority of section 7(c)(1). Essentially, this section empowers the Secretary to enter into agreements with States for use of their personnel and facilities. Thus, it furnishes another means of using talents of State and local governments in meeting the goals of the Act.

## INTERIM AGREEMENTS WITH THE STATES UNDER SECTION 18(h)

Section 18(h) provides the States with a temporary alternative to Federal preemption and an opportunity to begin participation in the Williams-Steiger Act. It does this by enabling the Secretary to enter into temporary agreements with States to permit the continued enforcement of those State occupational safety and health standards which address the same issues as Federal standards. The enforcement of such State occupational safety and health programs may continue until the Secretary takes final action with regard to a permanent State plan under section 18(b), or until December 28, 1972, whichever is earlier.

These State agreements bridge the gap between existing State occupational safety and health programs and State assumption of jurisdiction with an approved State plan under section 18(b) of the Act. States with 18(h) agreements have been able to maintain their programs without interruption, thereby maximizing the utilization of human and financial resources. In addition, worker protection has been increased by assuring the continuation of State programs in conjunction with the initiation of the Federal program.

Forty-seven States, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam have entered into 18(h) agreements. It is estimated that 18(h) agreements are protecting State-level programs which add almost $90 million in State and local occupational safety and health expenditures to the total program. Three States—Ohio, New Mexico, and South Dakota—did not have agreements as of the end of the year.

Several features of the agreement are particularly important during this interim period. First, there is a period of dual jurisdiction. State agencies are responsible for the administration and enforcement of on-going State occupational safety and health programs; at the same time, within all States and other jurisdictions, the Secretary of Labor has full authority and responsibility for the administration and enforcement of the Williams-Steiger Act. Second, for those standards which are the subject of the agreement, State agencies have agreed to maintain without diminution the level of State enforcement activity which

existed at the time of the agreement. Finally, the procedures for State agreements (29 CFR Part 1901) require State agencies to submit a notice of intent to file a State plan under section 18(b) in order for the 18(h) agreement to continue in effect.

Within the requisite time period, all 51 jurisdictions with 18(h) agreements filed letters of intent to submit a State occupational safety and health plan.

Federal enforcement activities have been coordinated with State agencies participating in 18(h) agreements. Coordination has been emphasized to minimize much of the duplication and overlap inherent in dual jurisdiction. An overall system for the coordination of compliance activities has been implemented by the Regional Administrators. This coordination includes the following:

On a weekly basis, each Regional Administrator provides designated State agencies with copies of all citations issued to employers within that State. Some agencies are providing Regional Offices with summary reports of State inspection and enforcement activity and with specific compliance information relating to a concurrent inspection visit. Federal compliance personnel are responsible for referring to State agencies information concerning apparent occupational safety and health hazards for which there are no applicable Federal standards. Similarly, State agencies have been requested to furnish Regional Administrators with information about apparent hazards which the State is unable to correct.

State agencies may, if they wish, participate in concurrent inspections. Designated agencies may choose to make State compliance officers available to fully participate in an OSHA inspection. The State staff should be immediately available so that no inspection is delayed. During a concurrent inspection each Federal and State compliance officer is responsible for conducting the inspection in full accord with his applicable regulations and instructions, including the initiation of citation and penalty actions. All State employees receiving information about concurrent inspections have been informed that the prohibition against advance notice is applicable to them.

Chart 14 illustrates safety and health issues covered by Federal standards which also are covered by State standards in States having 18(h) agreements.

## PLANNING AND DEMONSTRATION GRANTS—SECTION 23

Under sections 23 (a) and (f) of the Act, the Federal Government can provide up to 90 percent of the funds for grants to help States assess their needs and prepare State plans for their own assumption of jurisdiction under the Act. In order to provide prompt assistance to the States in the development of their occupational safety and health plans, a comprehensive system for awarding and monitoring grants, including program and accounting guidelines, was developed immediately following the effective date of the Act. These grants are authorized through June 1973.

Workforce populations of each State were used as a basis for allocation of grant funds. The States were divided into the following three groups:

1. The 10 States with the lowest workforce population—$115,000 each;
2. The 30 next highest States, and the District of Columbia and Puerto Rico—$160,000 each;
3. The 10 States with the highest workforce population—$230,000 each.

This division of available funds represents an effort to distribute available money so that all States have an equitable chance to develop their own occupational safety and health plans.

At the risk of funding only a few grant applications which might not ultimately result in an acceptable State plan, every State that requested money received some; this meant that some States were not given all the money they needed. The active interest among the States in developing and carrying out their own safety and health programs encouraged participation. Through December 31, 1971, grants had been made to 46 States, the District of Columbia, and Puerto Rico, for a total of $4,704,000. Additional funds totaling approximately $5.15 million will be made available to States in calendar year 1972 to augment the initial grants. Although no experimental and demonstration grants authorized by section 23(b) were issued in 1971, such grants are being considered for 1972. The monitoring system developed as a part of the overall grant administration machinery has revealed substantial progress by some of the States toward the submission of acceptable plans.

CHART 14

## State Standards Subject to 18(h) Agreements
### (Categorized by Federal Issues)

| Federal Issue / State | Alabama | Alaska | Arizona | Arkansas | California | Colorado | Connecticut | Delaware | D. C. | Florida | Georgia | Guam | Hawaii | Idaho | Illinois |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction Work | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| Ship Repairing | | | | | • | | | | | | | | | | |
| Shipbuilding | | | | | | | | | | | | | | | |
| Shipbreaking | | | | | • | | | | | | | | | | |
| Longshoring | | | • | | • | • | | • | | • | | | | | |
| Walking - Working Surfaces | • | • | • | | • | • | | • | • | • | • | | • | • | • |
| Means of Egress | • | • | • | • | • | • | • | • | • | • | | | • | • | |
| Powered Platforms, Manlifts, and Vehicle-Mounted Work | | • | • | | • | • | | • | • | • | | | • | • | • |
| Air Contaminants | • | • | • | | • | | • | • | • | • | • | | • | • | • |
| Ventilation | • | • | • | • | • | • | | • | • | • | • | | • | • | • |
| Occupational Noise Exposure | | | • | | • | | | • | • | • | | | • | | |
| Ionizing Radiation | • | | • | | • | • | • | | • | • | • | | • | • | • |
| Nonionizing Radiation | | | • | | • | • | | | • | • | • | | | | • |
| Hazardous Materials | • | • | • | | • | | | • | • | • | • | | • | • | • |
| Personal Protective Equipment | • | • | • | • | • | • | | • | • | • | • | | • | • | • |
| Sanitation | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| Temporary Labor Camps | | • | • | | • | • | | | | • | | | | • | • |
| Nonwater Carriage Disposal Systems | • | • | | | • | • | • | | • | • | • | | | • | |
| Safety Color Code for Marking Physical Hazards | | • | • | | | | | | • | • | | | | • | |
| Specifications for Accident Prevention Signs and Tags | • | | • | | | | | | • | • | | | | • | • |
| Medical and First Aid | • | • | | • | • | | • | | • | | • | | • | • | • |
| Fire Protection | • | • | • | | • | | • | • | • | • | • | | • | • | • |
| Compressed Gas and Compressed Air Equipment | • | • | • | • | • | | | | • | • | • | | • | • | • |
| Materials Handling and Storage | • | • | • | • | • | • | | • | • | • | • | | • | • | • |
| Machinery and Machine Guarding | • | • | • | | • | • | • | • | • | • | • | | • | • | • |
| Hand and Portable Powered Tools and other Hand-held Equipment | • | • | • | • | • | | | • | • | • | | | • | • | • |
| Welding, Cutting, and Brazing | • | • | • | • | • | | | • | • | • | • | | • | • | • |
| Pulp, Paper and Paperboard Mills | | | • | | • | | | • | | • | | | | • | • |
| Textiles | | | • | | • | • | | • | | • | | | | • | • |
| Bakery Equipment | | | • | | • | • | | • | • | • | | | | • | • |
| Laundry Machinery and Operations | | | • | • | • | • | | • | • | • | | | | • | • |
| Sawmills | | • | • | • | • | • | | | | • | | | | • | • |
| Pulpwood Logging | | • | | | • | | | | | | | | | • | |
| Agricultural Operations | | | • | | • | | | | | | | | | | • |
| Electrical | • | • | • | | • | • | | • | • | • | | | • | • | • |

Source: Department of Labor.

CHART 14 - Continued

## State Standards Subject to 18(h) Agreements
## (Categorized by Federal Issues)

| Federal Issue / State | Indiana | Iowa | Kansas | Kentucky | Louisiana | Maine | Maryland | Mass. | Michigan | Minnesota | Mississippi | Missouri | Montana | Nebraska | Nevada |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction Work | • | | • | • | • | • | • | • | • | • | | • | • | • | • |
| Ship Repairing | | | | | • | | | | | | | | | | |
| Shipbuilding | | | | | • | | | | • | | | | | | |
| Shipbreaking | | | | | • | | | | | | | | | | |
| Longshoring | | | | | • | | • | • | | | | | | | |
| Walking - Working Surfaces | • | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Means of Egress | • | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Powered Platforms, Manlifts, and Vehicle-Mounted Work | • | | • | • | • | | • | • | • | • | | | | | • |
| Air Contaminants | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| Ventilation | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| Occupational Noise Exposure | • | | • | • | • | • | | • | • | • | • | | | | |
| Ionizing Radiation | • | | • | • | • | • | • | • | • | • | • | • | | | • |
| Nonionizing Radiation | • | | • | • | • | | | • | | | • | • | | | • |
| Hazardous Materials | • | • | • | • | • | • | • | • | | • | • | • | | • | • |
| Personal Protective Equipment | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| Sanitation | • | | • | • | • | • | • | • | • | • | • | • | | • | • |
| Temporary Labor Camps | • | | • | • | • | • | • | | • | • | | | | | |
| Nonwater Carriage Disposal Systems | | | | • | • | | • | | | • | • | | | | • |
| Safety Color Code for Marking Physical Hazards | | | | | • | | | | | | | | | | |
| Specifications for Accident Prevention Signs and Tags | • | | | | • | • | • | | | | | • | | | |
| Medical and First Aid | • | | | • | • | • | | • | • | • | | • | | | • |
| Fire Protection | • | | • | • | • | • | • | • | • | • | • | • | | • | • |
| Compressed Gas and Compressed Air Equipment | • | | | | • | | • | • | • | • | • | • | | | • |
| Materials Handling and Storage | • | | • | • | • | | • | • | • | • | | | | | • |
| Machinery and Machine Guarding | • | | • | • | • | • | • | • | • | • | • | • | | • | • |
| Hand and Portable Powered Tools and other Hand-held Equipment | • | | | • | • | | • | • | • | • | | | | | • |
| Welding, Cutting, and Brazing | • | | • | • | • | | • | • | • | • | | | | | • |
| Pulp, Paper and Paperboard Mills | • | | • | • | • | • | • | • | • | • | | | | • | |
| Textiles | • | | • | • | • | • | • | • | • | • | | | | | |
| Bakery Equipment | • | | • | | • | | • | • | | • | | • | | | • |
| Laundry Machinery and Operations | • | | • | | • | | • | • | | • | | | | • | • |
| Sawmills | • | | • | • | • | • | • | • | | • | | • | • | | • |
| Pulpwood Logging | | | | | • | • | • | | • | • | | | • | | |
| Agricultural Operations | | | • | | • | | | | • | | | | | | |
| Electrical | • | • | • | • | • | • | • | • | • | • | | • | | • | • |

Source: Department of Labor.



457-200 O - 72 - 4

CHART 14 - Continued

## State Standards Subject to 18(h) Agreements
### (Categorized by Federal Issues)

| Federal Issue / State | N. H. | N. J. | N. Y. | N. C. | N. D. | Oklahoma | Oregon | Pennsylvania | P. R. | R. I. | S. C. | Tennessee | Texas | Utah | Vermont |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction Work | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| Ship Repairing | | | | | | | | | | | | | | | |
| Shipbuilding | | | | | | | | | | | | | | | |
| Shipbreaking | | | | | | | | | | | | | | | |
| Longshoring | | | | | | | | | • | | | | | | |
| Walking - Working Surfaces | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Means of Egress | • | • | • | • | • | | • | • | • | • | • | • | | • | • |
| Powered Platforms, Manlifts, and Vehicle-Mounted Work | • | | • | • | • | • | • | • | • | | • | | • | • | |
| Air Contaminants | • | • | • | • | | • | • | • | • | | • | • | | • | |
| Ventilation | • | | • | • | • | • | • | • | • | | • | • | | • | • |
| Occupational Noise Exposure | • | • | | • | | • | • | • | • | | • | • | | • | |
| Ionizing Radiation | • | • | • | • | | • | • | | • | • | • | • | | • | • |
| Nonionizing Radiation | | • | • | • | | • | • | | • | | • | • | | • | |
| Hazardous Materials | • | • | • | • | • | • | • | • | • | | • | • | | • | • |
| Personal Protective Equipment | • | • | • | • | • | • | • | • | • | | • | • | | • | • |
| Sanitation | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| Temporary Labor Camps | • | • | • | | | • | • | • | • | | | | | | |
| Nonwater Carriage Disposal Systems | • | • | • | • | | • | • | | | | • | • | | | |
| Safety Color Code for Marking Physical Hazards | | | | | | • | | | | | | | | | |
| Specifications for Accident Prevention Signs and Tags | | | | | | • | | • | | | | | | | |
| Medical and First Aid | • | • | • | • | | • | • | • | • | • | | • | | • | • |
| Fire Protection | • | • | • | • | | • | • | • | • | | • | • | | • | • |
| Compressed Gas and Compressed Air Equipment | • | | • | • | • | • | • | • | • | | • | • | | • | • |
| Materials Handling and Storage | • | • | • | • | • | • | • | • | • | • | • | • | | • | |
| Machinery and Machine Guarding | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Hand and Portable Powered Tools and other Hand-held Equipment | | | • | • | • | • | • | • | | | • | • | | • | |
| Welding, Cutting, and Brazing | | • | • | • | • | • | • | • | • | | | • | | • | • |
| Pulp, Paper and Paperboard Mills | | | | | | • | • | • | | | | | | | |
| Textiles | • | | • | | | • | | • | | | • | | | • | |
| Bakery Equipment | | | | | | | | • | | • | | | | • | |
| Laundry Machinery and Operations | | | • | | | • | | • | | • | | | | • | |
| Sawmills | | | | | | • | • | • | | | | | | • | |
| Pulpwood Logging | | | | | | • | • | • | | | | | | • | |
| Agricultural Operations | | | | | | | • | | • | | | | • | | |
| Electrical | • | • | • | • | • | • | • | • | • | | • | • | | • | • |

Source: Department of Labor.

CHART 14 - Continued

**State Standards Subject to 18(h) Agreements**

**(Categorized by Federal Issues)**

| Federal Issue / State | Virginia | Washington | West. Va. | Wisconsin | Wyoming |
|---|---|---|---|---|---|
| Construction Work | • | • | • | • | • |
| Ship Repairing | • | | | | |
| Shipbuilding | | | | | |
| Shipbreaking | • | | | | |
| Longshoring | • | • | | | |
| Walking - Working Surfaces | • | • | • | • | • |
| Means of Egress | | • | • | • | • |
| Powered Platforms, Manlifts, and Vehicle-Mounted Work | • | • | • | • | |
| Air Contaminants | • | • | • | • | |
| Ventilation | • | • | • | • | • |
| Occupational Noise Exposure | • | • | • | • | |
| Ionizing Radiation | • | • | • | • | |
| Nonionizing Radiation | • | • | • | • | |
| Hazardous Materials | • | • | • | • | |
| Personal Protective Equipment | • | • | • | • | |
| Sanitation | • | • | • | • | |
| Temporary Labor Camps | • | • | | • | |
| Nonwater Carriage Disposal Systems | • | • | • | | |
| Safety Color Code for Marking Physical Hazards | • | • | | | |
| Specifications for Accident Prevention Signs and Tags | • | • | | | |
| Medical and First Aid | | • | • | • | |
| Fire Protection | • | • | • | • | • |
| Compressed Gas and Compressed Air Equipment | • | • | • | • | • |
| Materials Handling and Storage | • | • | • | • | |
| Machinery and Machine Guarding | • | • | • | • | • |
| Hand and Portable Powered Tools and other Hand-held Equipment | • | • | • | • | |
| Welding, Cutting, and Brazing | • | • | • | • | |
| Pulp, Paper and Paperboard Mills | • | • | | • | |
| Textiles | • | | | • | |
| Bakery Equipment | • | | | • | |
| Laundry Machinery and Operations | • | | | • | |
| Sawmills | • | | | • | |
| Pulpwood Logging | • | | | • | |
| Agricultural Operations | | | | | |
| Electrical | • | | • | • | • |

Source: Department of Labor.

## STATE PLANS—SECTION 18(b)

Section 18(b) of the Act provides States with an opportunity to operate their own occupational safety and health programs so long as they meet certain criteria and are at least as effective as the Federal program in assuring the safety and health of workers. If a State wishes, it may submit a plan to the Assistant Secretary covering one or more occupational safety and health issues that have been addressed by a Federal standard. The scope of a State plan may be broad or narrow; that is, a State may choose to cover a number of issues or only one. Regardless of the number of issues covered, however, the State must include all employers and employees within the affected industrial, occupational, or hazard grouping unless the State shows good cause why any groups of employers or employees should be excluded. Any groups excluded by a State plan remain covered by Federal standards and enforcement programs.

Foremost among the criteria that a State plan must meet is the requirement that the plan provide for the development and enforcement of standards that are or will be at least as effective as the Federal program in affording safe and healthful employment.

It is important to recognize that the State plan need not provide a program which is identical to the Federal, but only that it must be at least as effective. In order to satisfy the requirements of effectiveness, the plan may establish the same standards, procedures, criteria, and rules as those set forth in the Federal program, or alternate ones which, when measured against Federal standards and enforcement procedures, are determined to be at least as effective. Comparison of different State standards with Federal standards to assess effectiveness will be a major undertaking. In addition to the general requirement that the State will develop and enforce standards at least as effective as those promulgated by the Secretary, it must also meet such specific criteria as providing the legal authority, personnel, and funds to do the job, and the right of entry into and inspection of all workplaces subject to the Act.

As mentioned before, all 51 jurisdictions with 18(h) agreements indicated their intention to submit plans for developing safety and health standards and enforcing them within their borders. New Mexico and South Dakota also submitted written letters of intent. These intentions were made

known following publication of the final regulations governing the preparation and submission of State occupational safety and health plans (Title 29: Labor; Chapter XVII: Occupational Safety and Health Administration, Department of Labor; 29 CFR Part 1902—*State Plans for the Development and Enforcement of State Standards*). However, it should be noted that these formal written letters of intent come from State agencies designated by Governors to be responsible for occupational safety and health programs under the Act. They do not necessarily reflect a consensus of all the interest groups in the States; in addition, many programs are predicated on State legislative action for both enabling legislation and authorization of resources. Initial response from the States has been vigorous, but there are criteria in the regulations on State plans which the States must satisfy if they are to become full partners under the Act. These regulations set forth the specific criteria for State plans, the indexes for measuring a plan with regard to standards and enforcement, and the procedures for submission, approval, and rejection of State plans.

Once a State plan is approved, the Secretary is authorized to make operational grants to the States to assist them in administering and enforcing programs for occupational safety and health contained in their 18(b) plans. The Federal share for such approved grants may not exceed 50 percent, and unlike the 90–10 planning grants, there is no terminal date for operational grant authority. It is possible for a State to qualify for both types of the above-mentioned grants and receive money concurrently from several grants.

A great deal of effort has been directed toward giving technical assistance to States to aid them in preparing to meet the requirements for section 18(b) plans. Typical of such activities were the regionally sponsored meetings with State designees following publication on October 29, 1971, of the final regulations dealing with State plans. The purpose of these meetings was to obtain States' reactions to the regulations and identify problem areas that States were likely to encounter. One result of this endeavor has been the preparation of a series of guidelines or interpretative memoranda designed to help the States to develop their 18(b) plans. These guidelines dealt with such subjects as: "Procedures for Submission of State Plans and Regional Office Review"; "Procedures for National Office Review"; "Scope of State Plan"; "Definition of Developmental Plan"; and "Designation of State Agency". Extensive technical assistance has been provided by the regional staffs to the States with assistance from the national and regional offices upon request. In addition to this day-to-day communication, a considerable effort is expended in dealing with the International Association of Governmental Labor Officials, especially with its Occupational Safety and Health Committee.

Of the eight criteria contained in the Act that a plan must meet, the most significant and the most difficult is the "at least as effective" test. That is, the State plan must provide for safety and health standards that are or will be at least as effective as Federal standards and enforcement. A crucial aspect of this is that State plans must provide for sanctions against violations of standards in the first instance. Many States have plans to meet this challenge by enacting laws that will enable them to meet Federal standards. However, until State legislatures take final action on budgets, safety and health laws, merit systems, and laws that may be required to cover employees of State agencies and political subdivisions, it will not be possible to measure the extent of success or failure of legislative programs. Two States, Illinois and South Carolina, adopted major new enabling legislation for this purpose in 1971, many other States prepared to introduce new legislation in 1972, and still more are planning to do so in 1973.

There are basically two types of written State plans that can be approved by the Assistant Secretary. One is a "complete" plan that at the outset meets all the specific criteria and indexes of the regulations. The plan then is subject to the 3-year (minimum) period of evaluation described fully in the following section on State plan evaluation.

Second, if a State plan does not fully meet the requirements set forth in the 18(b) regulations, it may be approved as a developmental plan under certain conditions. The plan may be approved if it contains satisfactory assurances by the State that it will take the necessary steps to bring it into conformity with the criteria in the regulations within a maximum of 3 years immediately following the commencement of operations. The State shall include the specific actions it proposes to take and a time schedule for their completion. After the State has completed all the developmen-

tal steps specified in its plan which are designed to make it at least as effective as the Federal program, the Assistant Secretary has a period of at least 1 year in which to evaluate the plan on the basis of actual full-scale operations. With either type of plan, after this evaluation and determination that the State is meeting the requirements of the Act, the Assistant Secretary's enforcement authority will cease to apply with respect to any occupational safety or health issue covered by the plan. However, the Assistant Secretary will continue to make an evaluation of the manner in which the State is carrying out its plan, and will withdraw approval of all or part of the plan where there is a failure to adhere to the criteria.

During the evaluation period before the Assistant Secretary determines that the plan is "at least as effective," he retains Federal enforcement authority to the degree necessary to insure occupational safety and health. Factors that will determine the level of Federal effort during this period include whether the plan is developmental or complete, and the results of evaluations conducted by the Assistant Secretary.

The history of protective labor legislation over the years has been characterized by expanded coverage of workers and removal of exemptions for various groups of employees.

State and local employees, however, can only be covered through the vehicle of State plans, as they are specifically excluded from Federal coverage under the Act. This group, numbering approximately 10 million, must be covered by a State, to the extent that State laws permit such coverage. In the event that State laws existing before the implementation of the Act specifically exclude public employees, the State is not required to cover them in its plan.

## STATE PLANS—EVALUATION

The Act requires the Secretary of Labor "on the basis of actual operations under an approved State plan" to determine whether the criteria in section 18(c) are being applied by the State. This determination will not be made for at least 3 years after the approval of a "complete" plan. In the case of an approved developmental plan, the determination will not be made until all steps specified in the plan have been completed and the Secretary has had at least 1 year in which to evaluate the program on the basis of actual full-scale operations. At this point, the Secretary can determine that the State plan is "at least as effective" as the Federal program and relinquish his enforcement authority in that State. However, the Act adds that the Secretary will ". . . make a continuing evaluation of the manner in which each State having a plan approved . . . is carrying out such plan."

To insure that the Occupational Safety and Health Administration will be able to judge the effectiveness of approved State plans in operation, a State program evaluation system is being developed.

The methodology used will vary according to the stage at which the operational State plan is being evaluated. Three major phases, with differing requirements, have been identified:

*Phase I:* Evaluation of plans after approval, during the minimum 3-year period required by section 18(e) of the Act during which the Secretary must retain his enforcement authority. Further refinements are required in this phase to distinguish evaluation of developmental from completely operational plans.

*Phase II:* Evaluation of plans enabling the Secretary to make a final determination on relinquishment of Federal enforcement authority.

*Phase III:* Continued evaluation, after relinquishment of Federal enforcement authority, to insure maintenance of required State effectiveness.

It is anticipated that the Secretary not only will be able to measure the impact of the States' programs as they relate to the conditions of employment, but also will be able to:

1. Show trends within the total program and trends within program components.
2. Correlate accident/injury frequencies and severity rates with various program variables.
3. Measure total program progress and individual State program progress.
4. Measure differential effects of various program efforts.

The State program evaluation system will be a multilevel system. Recognizing that evaluation is an important function at each level of management, the system is being designed to function as an overall evaluation system. The first level of the evaluation process will be a self-evaluation system for use by individual States. The second level will assess the program on a regional basis and will be implemented by the OSHA field staff. The third level will be implementation at the national level.

The system will require periodic reports from the States. However, all report forms will be tested and validated before being used. Other methods of collecting data concerning State program implementation and operation will be through onsite visits by OSHA regional staff with periodic participation and/or followup by OSHA national staff. In addition, as part of the State program evaluation system, followup inspections will be made by Federal compliance safety and health officers and industrial hygienists of establishments covered by the State program on a random sampling basis.

## SUPPLEMENTARY APPROACHES TO STATE PARTICIPATION

As mentioned earlier, an additional tool for enlisting State participation under the Act is the agreement authority of section 7(c)(1). During 1971, an experimental agreement program was undertaken to expand the resources available to OSHA under the Target Industries Program. Eight States agreed, on a reimbursable basis, to assist the Department of Labor in enforcing Federal occupational safety and health standards in four of the Nation's most hazardous industries, (details appear in Chapter VII, "Special Programs"). Under the agreement, the eight States are providing 68 federally trained State compliance officers to inspect approximately 4,000 establishments within their boundaries in fiscal 1972.

The advantages of this experiment were several: (1) OSHA expanded its inspection staff by 68 persons; (2) State personnel received valuable experience with Federal enforcement techniques; (3) the State inspector, acting as an agent of the Secretary, inspected simultaneously against both State and Federal standards, thus minimizing duplication of inspection effort.

The results of this program are being evaluated to determine its impact and effectiveness. Indications are that this type of program appeals to the States. Although this program is not an alternative to a State plan, it is possible that State participation via section 7(c)(1) will play an important future role in assisting the Secretary in carrying out his responsibilities under the Act.

## STATISTICAL GRANT PROGRAM

The statistical grant program administered by the Office of Occupational Safety and Health Statistics of the Bureau of Labor Statistics is conducted under the authority of sections 23 and 24 of the Williams-Steiger Act. Five types of statistical grants can be awarded. Under section 23, a State agency designated by the Governor may receive grants for planning statistical programs and for experimentation or demonstration projects in collecting statistical data on occupational injuries and illnesses. These grants are awarded on a 90–10 cost-sharing basis, with 10 percent of the cost contributed by the State agency.

Section 24 of the Act deals entirely with the collection and analysis of statistics and is the basis for operational grants that can be awarded for three purposes: (1) to engage in programs of studies, information, and communications concerning occupational safety and health statistics; (2) to assist States or their political subdivisions in developing and administering of programs dealing with safety and health statistics; and (3) to arrange for research and investigations that give promise of furthering the other objectives of this section. These grants are awarded on a 50–50 basis.

One objective of the Act is to foster the development of comprehensive occupational safety and health statistical programs in each State. The grants program will aid in providing the data needed to support standards development and compliance activities in each State and be particularly useful to those States operating programs under section 18(b). Each State statistical program will, therefore, be tailored to the needs of that State. A second objective is to expand the annual national statistical survey to increase the capability for special research in occupational safety and health. Special research projects conducted under a grant to one State may also be of value to the national research program or to other State programs.

The dual goals of serving State needs in the area of occupational safety and health data and providing added support for the effort at the national level are achieved through the grants program. Grant approval authority is decentralized to the eight Regional Directors of the Bureau of Labor Statistics. The Regional Directors are in the best position to provide prompt consideration of grant application that pertain to particular State needs and, therefore, to coordinate national and State program goals.

Encouraging progress has been made since the Act went into effect. By the end of December 1971,

all States and territories eligible for grants had received statistical planning funds, with the exception of Ohio, American Samoa, and the Trust Territory of the Pacific Islands. Planning grants for the 48 other States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands have totaled $872,542 on the 90-percent Federal cost-sharing basis. Of this total, $650,000 was distributed before June 1971. The States are using these funds to prepare for participation in the 1972 occupational safety and health survey of employers. Differences in Federal funding levels for planning among the States relate to differing State salary levels and other features unique to a particular State grant.

Eleven States planned in January 1972 to begin a full-fledged State operational program for collecting of occupational injury and illness data. Grants totaling $125,000 have been awarded for these programs on a 50-percent State-Federal sharing basis. These States are surveying employers according to Bureau of Labor Statistics survey procedures to develop estimates of injuries and illnesses by industry for the State. Procedural controls contained in these operational grants ensure the uniformity of data among States and provide comparability with national data.

During 1971, administrative priorities have been focused on developing of current national and State injury and illness data by industry. Information and communication grants and special research grants, which are also available on a 50-percent sharing basis, will be awarded as funds are available.

## Chapter 7

# SPECIAL PROGRAMS

While the overall goal of the Department is to reduce exposure to all occupational safety and health hazards in all workplaces, this cannot be done overnight. For many hazardous conditions, new standards must be developed, and an adequate supply of compliance personnel needs to be recruited and trained. Yet, there is a need to make an immediate impact on known safety and health problems so that all employers and employees become aware of their responsibilities and can work to improve the situation. After surveying the occupational safety and health picture generally, OSHA has decided that such an immediate impact could best be achieved by designing special programs which have served as demonstration projects and allow the concentration of resources on some of the worst problems first. Two major special programs were developed during the year, the first concentrating on industries with a record of a high incidence of occupational injuries, and the second designed to focus on particular toxic materials known to pose health hazards on the job.

### TARGET INDUSTRY PROGRAM

Occupational injuries have been measured for a considerable time under the American National Standards Institute's Z16.1 standard. This standard produces injury frequency rates based on the average number of disabling work injuries for each million employee hours worked in a range of industries. The Bureau of Labor Statistics data for 1970 show that the average injury frequency rate for all manufacturing industries was 15.2. Over the years, however, a number of industries have produced injury frequency rates considerably above this level. In order to make an immediate impact on the apparently existing safety problems, a special program was developed to concentrate efforts on five selected industries whose 1970 injury frequency rates exceeded 33. This is called the Target Industry Program.

Although the selection of the five target industries was based primarily on high injury frequency rates, a number of other factors were considered. Among these were the existence of standards applicable to the industries, the number of employees affected, and the distribution of the industry throughout the country. The five industries selected are: marine cargo handling; roofing and sheet metal; meat and meat products; miscellaneous transportation equipment; and lumber and wood products.

To launch the Target Industries Program, a series of 10 meetings was held in late May and early June 1971. Five of the sessions were with national trade association representatives of the target industries and a like number with employee organization representatives. These meetings provided a general briefing on the Act, on employer and employee responsibilities, and on implementation of the Target Industries Program. Employer and employee groups were encouraged to aid in reducing injuries and illnesses, and were asked to take three specific actions:

1. To ensure the existence of active industry safety and health committees;
2. To develop plans for action within the industry that will lead to improved safety and health conditions; and
3. To disseminate information to their memberships and others.

The Department moved early to provide training and consultative services in occupational safety and health in high-hazard industries. In the five target industries, this support consisted primarily of consultative services in hundreds of meetings

and other contacts with trade association personnel and with representatives of employees.

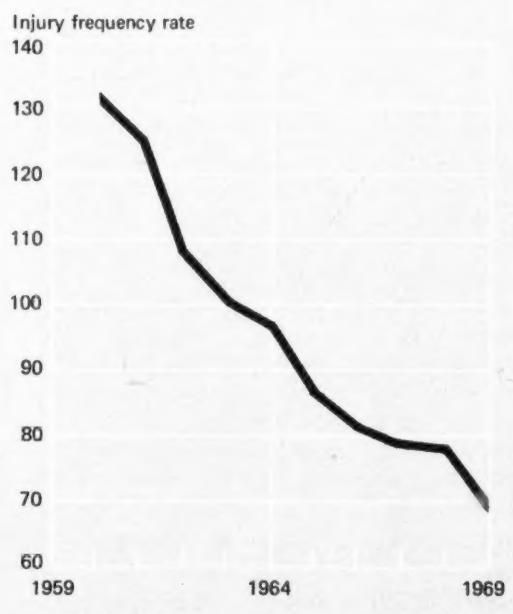
The National Safety Council agreed to participate in the target industry effort by assisting target industry groups in developing their own programs for safety and health and by designating staff experts in each industry to work with the respective target industries. The National Safety Council has met with both national and local association groups within the Target Industry Program and has been instrumental in establishing guidelines for the development of formalized safety programs for association members, with the emphasis on voluntary compliance.

General meetings included a Federal-State-American National Standards Institute meeting June 2, the NAM closed-circuit teleconference June 10, and a national conference for employers August 25. At a general trade association meeting in June, each target industry group made a presentation on its own problems and its plan for overcoming them. Progress by the industries varies, but all are taking positive steps toward voluntary compliance.

CHART 15

***Injury Frequency Rate***

**Longshoring, Nine-Year Record**




Source: Department of Labor.

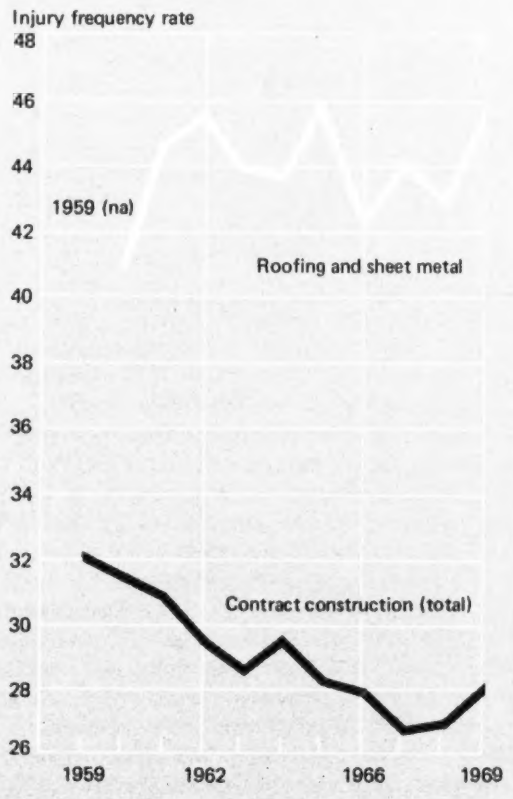
Specific details on each of the five industries and what has been accomplished are:

A. *Marine Cargo Handling* (Standard Industrial Classification—SIC—No. 4463) includes loading and unloading vessels, stevedoring, operation and maintenance of piers and docks, and waterfront terminal operations. The industry employs more than 112,000 workers and has the highest injury frequency rate, 69.9, of the five target industries. (However, this rate was compiled only with regard to those employees in the industry covered under the safety provisions of the Longshoremen's and Harbor Workers' Compensation Act. In the future, data will reflect the entire industry classification.) The Management Advisory Cargo Handling Safety Committee, the safety association representing this target indus-

CHART 16

***Injury Frequency Rate***

**Roofing and Sheet Metal, Ten-Year Record**




Source: Department of Labor.

try group, is participating in the activities of ANSI's Longshoring Safety Standards Committee. Four of its members serve on the 12-member steering committee, which is revising the 1968 edition of the ANSI standards. The Management Advisory Cargo Handling Safety Committee has restructured its organization and hired a permanent, nonmember secretary. Difficulties in launching a broad new effort in the industry are due largely to labor problems, including strikes and injunctions, which have diverted attention from accident and illness prevention.

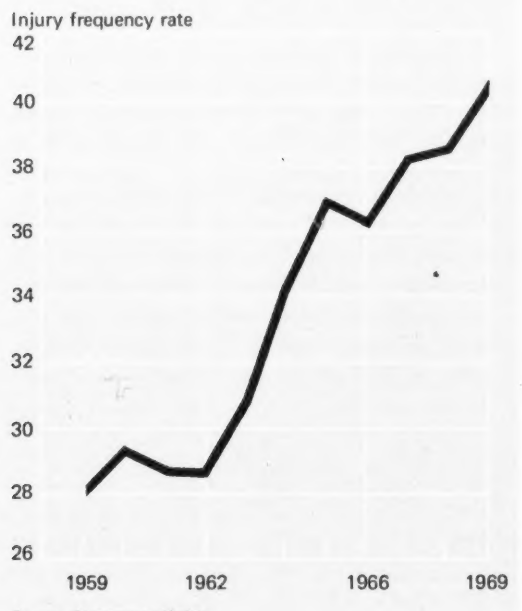
B. *Roofing and Sheet Metal Work* (SIC No. 176) includes coppersmithing and tinsmithing in connection with construction work, gutter installation, roofing and siding, skylight installation, etc., but does not include work in connection with plumbing, heating, or air conditioning. The industry employs about 115,000 covered workers, and has a injury frequency rate of 43.0. The National Roofing Contractors Association has developed a "Roofing Contractors Guide" to isolate standards that affect the more serious hazards in the industry in an attempt to direct the attention of its members to the "worst-first." The Sheet Metal and Air Conditioning Contractors National Association has formed an Occupational Safety and Health Committee, published a guide to the Act for distribution to its members, and is developing vertical standards for the industry to be proposed to the Department.

C. *Meat and Meat Products* (SIC No. 201) covers establishments primarily engaged in the slaughtering, dressing, packing, freezing, and canning of animals for meat to be sold or used in making other meat products. This industry employs 356,000 workers, with an injury frequency rate of 43.1. This group has formed a Meat Industry Safety Committee, and the following subcommittees: Standards Study, Research and Statistics, and Training, Education and Motivation. It has published a 20-page analysis of meat plant injuries correlated with the requirements of the Act.

CHART 17

***Injury Frequency Rate***

**Meat and Meat Products, Ten-Year Record**

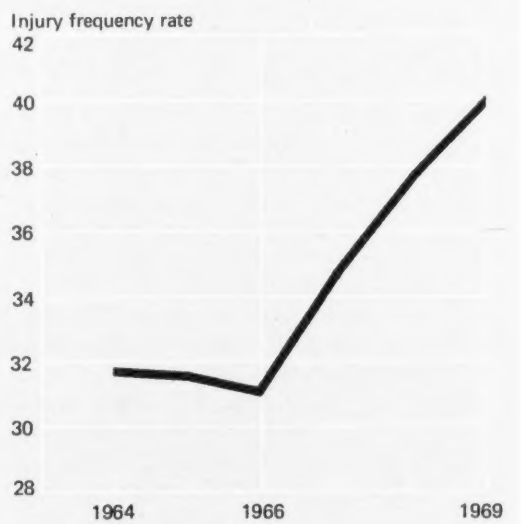



Source: Department of Labor.

CHART 18

***Injury Frequency Rate***

**Mobile Homes and Other Transportation Equipment, Six-Year Record**




Source: Department of Labor.

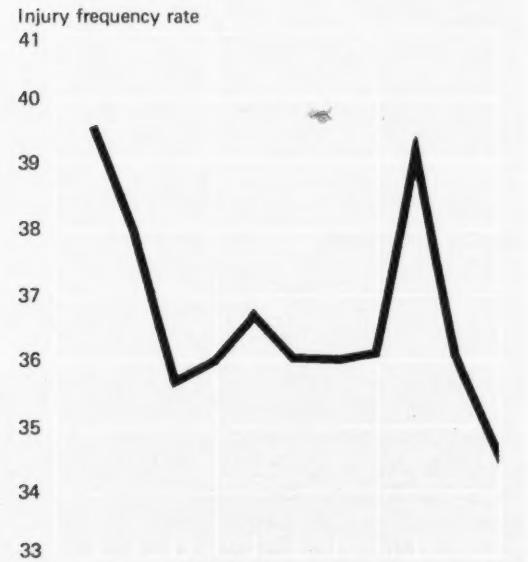
D. *Miscellaneous Transportation Equipment* (SIC No. 379) includes firms engaged in manufacturing mobile homes, campers, snowmobiles, trailers, carts, wagons, etc. The industry employs approximately 115,000, primarily in the manu-

facture of mobile homes. It has an injury frequency rate of 33.3. The Mobile Homes Manu-

CHART 19

*Injury Frequency Rate*

**Lumber and Wood Products, Ten-Year Record**




Source: Department of Labor.

facturers Association has published questions and answers related to OSHA and other bulletins for its membership. OSHA has held several meetings with this group but the heterogeneous nature of the industry has caused some uncertainty as to the best course to pursue. However, many companies are developing their own safety programs.

E. *Lumber and Wood Products* (SIC No. 24) includes logging camps, sawmills, and establishments manufacturing finished articles made of wood or wood substitutes. (It does not include furniture.) All segments of the industry share in a high injury frequency rate of 34.1 affecting 600,000 employees. Even before the announcement of the Target Industry Program, this industry formed the Forest Industry Council Safety and Health Coordinating Committee to establish guidelines for compliance under the Act. This committee represents 25 associations. Safety training programs have been developed and are operative. A Standards Committee is functioning and a major industry program was developed to update all national, regional, and State associations on the committee's progress. This industry continues to be active in its pursuit of voluntary compliance.

OSHA field compliance efforts have also been concentrated on those five industries. Not only have inspections in these industries been given priority, but OSHA signed agreements with eight States on July 14, 1971, under which the States are assisting in making inspections in four of the target industries. Marine cargo handling was not included in the State contracts because of the long-standing Federal compliance program in that industry and the lack of State jurisdiction. As of December 31, 1971, inspections of target industry workplaces by both Federal and State compliance officers totaled 3,754, resulting in 3,221 citations being issued.

The eight States—California, Florida, Illinois, New York, North Carolina, Oregon, Pennsylvania, and Washington—were selected primarily because of the concentration of target industry establishments within their borders. About 4,000 establishments with more than 1 million employees will be inspected by the 68 State compliance officers in the program, all of whom completed a 5-week training program on Federal standards and compliance procedures. These agreements, funded at $878,000, expire on June 30, 1972, though it is planned to extend them in some States so that additional inspections may be made.

## TARGET HEALTH HAZARD PROGRAM

It was early recognized that occupational illnesses are at least as great a problem as injuries, but it was much more difficult to develop a special program that would allow OSHA to effectively focus on them. By the end of 1971, however, the Target Health Hazards Program had been developed, to be implemented early in January 1972. This provides a health program counterpart to the injury-oriented Target Industries Program. In it, OSHA will concentrate on five substances that are among the most hazardous of the more than 8,000 toxic substances currently identified by the National Institute for Occupational Safety and Health of the Department of Health, Education, and Welfare. Among the criteria for selection were the number and severity of employee exposures, the existence of standards, and the ability to adequately measure the level of exposure involved. The five health hazards selected were:

A. *Asbestos.* Can produce a severe lung disease called asbestosis. In addition, there is evidence that asbestos fibers in the lung may lead to cancer. The best estimates put employees facing risk at 200,000–plus in insulation, manufacturing products using asbestos in one or more ways, shipbuilding, construction, etc.

B. *Cotton dust.* Can produce byssinosis, a progressively disabling lung disease. At risk are more than 800,000 employees in cotton processing operations of all types.

C. *Silica.* Can produce silicosis, another disabling lung disease. At risk are more than 1.1 million employees in abrasive manufacturing, iron and mineral processing, sandblasting, and other operations.

D. *Lead.* Can produce severe gastrointestinal, blood, and central nervous system disabilities. At risk are more than 1.6 million employees engaged in manufacturing ammunition, paint, storage batteries, autos, etc.

E. *Carbon monoxide.* Can produce brain damage or death. At risk are uncountable thousands of employees in metal processing operations and users of gasoline-powered equipment.

In order to implement this program, it is planned to start with a series of meetings with affected employer and employee representatives to ensure that they know what the applicable standards are and what OSHA industrial hygienists will be looking for during inspections, as well as to solicit their assistance in making workplaces more healthful. This special program will be incorporated into the priority list under which the field staff of OSHA schedules enforcement actions. To add to the impact of this program, it is planned to seek agreements with a number of States similar to those for the Target Industry Program under which State industrial hygienists will receive training in the Federal standards and procedures and make additional inspections for OSHA.

## Chapter 8

# NATIONAL REPORTING OF WORK INJURIES AND ILLNESSES

Collection and publication of work-injury statistics have comprised one of the oldest on-going programs in the Bureau of Labor Statistics (BLS). However, it was not until the American Standard Method of Measuring and Recording Work Injury Experience, the Z16.1 standard, was accepted in 1937 by employers and statistical agencies that sufficient uniformity in injury recordkeeping and reporting made possible the annual collection of national work-injury data by BLS.

Two basic measures were used in the publication of the injury series under the Z16.1 method—frequency rates and severity rates. Injury frequency, calculated in terms of the number of disabling injuries per million employee-hours worked, measured the magnitude of the work-injury problem; injury severity was a gauge of the seriousness of work accidents in terms of days lost due to disabling injuries per million employee-hours worked. Following the last major revision of the Standard Industrial Classification system in 1957, the BLS-published statistics on work injuries by industry from 1958 through 1970 represented a consistent series.

In recent years, employers in approximately 50,000 manufacturing and about 100,000 nonmanufacturing firms, together employing a total of about 15 million workers, have voluntarily participated in reporting work injury statistics under the Z16.1 method. Although these establishments were located in each of the 50 States, only 20 States formally joined in the BLS cooperative program of reporting work-injury data. Injury statistics were published for as many as 460 manufacturing and 170 nonmanufacturing separately identifiable industries.

Despite the seemingly extensive collection and publication program under the Z16.1 method, the data were limited because the true extent of injuries and illnesses incurred by workers at their jobs was understated. Aside from the fact that the statistical universe for these data included only those employers who volunteered to record and to report work-injury information to the BLS, other factors also contributed to the undercount of injuries under the Z16.1 method.

One such factor of conceptual nature concerned the scope of reportable injuries. Under procedures formulated by the American National Standards Institute and adopted by the Department of Labor, only disabling injuries were counted in the computation of injury rates. The disabling classification limited reportable injuries to three varieties: those resulting in death; those involving permanent impairment, either total or partial; and those temporary disabilities that would prevent an employee from performing the duties of a regularly established job beyond the day of injury. Injury cases involving fractional days lost, either on the day of injury or on the day of return to full-time work, were not reportable even if medical treatment were involved.

A second major inadequacy of reporting occupational injuries was that under the Z16.1 system occupational illnesses were seldom, if ever, reported. Estimates of occupational illnesses were largely restricted to the most obvious and extreme cases, such as silicosis. Even in cases where State workmen's compensation laws provided for indemnity benefits for occupational illnesses and injuries, lack of uniformity in State laws precluded a realistic counting of illnesses befalling workers on the job.

These inadequacies were recognized by the Congress when it legislated a mandatory system of recordkeeping and reporting of occupational injuries and illnesses under the Williams-Steiger

Act. The shift from voluntary to mandatory compliance means that virtually all employers throughout the country are now required to maintain records of work-related injuries and illnesses and to report their injury experience to BLS upon request. By including all employers, BLS has greatly expanded its statistical universe from the former field obtained through voluntary cooperation to one of 60 million workers in about 5 million workplaces.

In addition, the Williams-Steiger Act accords equal importance to occupational illnesses as well as injuries regarding both their identification and prevention. Employers must maintain records of all cases of occupational illness and injury other than those requiring only first aid treatment.

## NATIONAL SAFETY COUNCIL DATA

The National Safety Council (NSC) has also been for many years a well-known source of work-injury statistics based on the Z16.1 method. NSC estimates of work injuries indicate that in recent years more than 14,000 Americans are killed at work and more than 2 million suffer disabling injuries annually. The yearly cost of work accidents is estimated at $9.1 billion in 1970. This total includes a $4 billion estimated cost of injuries, insurance and administrative costs, an estimate of $4 billion other costs arising out of these accidents, and $1.1 billion direct losses in business fires. These estimates are considered conservative.

The annual survey conducted by the NSC includes information from firms involved in a wide range of economic activity. Because participation in the survey has been largely limited to NSC members—firms voluntarily affiliated with the Council—their data have tended to reflect the work-injury experience of more safety-conscious firms in each industry. While the National Safety Council plans to continue its collection for work-injury information under the Z16.1 standard, the work-injury estimates forthcoming under OSHA definitions will not be comparable with the Z16.1 series.

## THE MANDATORY SYSTEM

In 1969, Secretary of Labor J. D. Hodgson (then the Under Secretary) informed the American National Standards Institute that a proposed occupational safety and health act would require the establishment of a national mandatory system for the collection of safety and health statistics. ANSI was requested to evaluate the effectiveness and applicability of its Z16.1 system as the standard for a national mandatory system. In response, ANSI formed a study group to "review available reporting methods and standards of reporting injuries on a nationwide basis and if necessary develop a simple method of reporting injuries."

The study group found that, for a mandatory national reporting system, the Z16.1 standard, with its detailed severity charges for different kinds of injuries and special exceptions, was too complex. The standard was also found to be too insensitive to measure short-term trends in injury experience. Finally, the ANSI study group proposals were circulated for comments among various associations, the Bureau of Labor Statistics, Labor and Business Research Advisory Committees, Federal agencies, and other interested parties. Early in 1971, a Federal interagency working group was established to review the comments.

This interagency group considered not only the statistical requirements but also the potential needs of compliance personnel. As a result, one new system was developed, and proposed regulations were published in the Federal Register May 11, 1971. Many suggestions solicited from the public and from a public hearing convened by the Office of Management and Budget on June 8, 1971, were incorporated into the final recordkeeping regulations published in the Federal Register and adopted on July 2, 1971. As the recordkeeping system became operable, further revisions were found necessary to avoid undue burdens on employers. Rule changes allowing more time for preparation of records and permitting their preparation away from the establishment or on data processing equipment were proposed in the Federal Register on November 12. Following a 20-day period for comments and incorporation of needed modifications, the revision of the recordkeeping regulations will be published in the Federal Register early in January 1972.

Most employers were notified in the summer of 1971 that they are responsible for keeping records of work-related injuries and illnesses. The Bureau prepared a recordkeeping booklet containing the necessary forms, instructions for completing them, a copy of a poster that must be displayed in each workplace to inform employees of their rights and responsibilities, and a summary of the Act. More than 5 million copies of the recordkeeping booklet were mailed to nonagricultural and agri-

cultural employers registered on the Social Security Administration mailing lists. All recordkeeping and reporting requirements have been planned to minimize the burden on the employer while still providing accurate data for planning and enforcement purposes.

The new recordkeeping system is designed to obtain reliable, current, and uniform information about occupational injuries and illnesses at the workplace. It is the basic source of data for the statistical program. In addition, the system will provide Federal and State safety and health inspectors with on-the-spot records of each occupational injury and illness. The maintenance of records will also serve to heighten employers' and employees' awareness of safety and health problems.

Among several areas of change brought about by the new recordkeeping system, two of the most basic are mandatory compliance and extension of coverage. All covered employers must maintain records as set forth in the regulations and must comply with reporting requirements. Coverage under the Act extends to all employers engaged in business affecting interstate commerce who have employees; however, this coverage does not include the United States, States, or political subdivisions of a State. Accordingly, this has been interpreted to include virtually every nonpublic employment relationship where there are one or more employees, including industries exempt from other provisions of the Williams-Steiger Act.

The OSHA definitions of recordable occupational injuries and illnesses represent the most dramatic change from the old Z16.1 system. OSHA definitions start with specific instructions from Congress. The Act states that employers shall record and report, and the Department of Labor shall compile, statistics on work-related deaths, injuries, and illnesses (other than minor injuries requiring only first aid treatment). Capturing illness data will significantly improve the picture of what is really happening to employees in the Nation's workplaces.

Transfer to another job is an important addition to the Bureau's recordkeeping system. Eliminated is the former concept that no time was lost (and, hence, that no injury was recorded) as long as the employee could carry out an established job open and available to him. Any change in occupation caused by an occupational accident or illness is now considered recordable. This change alone should result in a substantial increase in recorded job accidents and illnesses.

Another significant change is the elimination of the old time-charge system. Instead of a fixed-time charge for specific injuries—a basic characteristic of the Z16.1 standard—the exact number of full lost workdays is being recorded. Recording of fatalities also is changed.

The OSHA reporting system will also be conceptually different from the Z16.1 system. The base for reporting injury frequency rates will be 100 full-time employees, compared with 1 million employee-hours worked previously used. As a result of the changes in recordable injury and illness classifications, all Z16.1 measures such as severity rates, average days charged per permanent-partial disabling injury, etc., will no longer be available. In their place will be a series of OSHA-based measures, such as injury- and illness-incidence rates, lost workday cases, and number of lost workdays.

## THE OSHA RECORDKEEPING SYSTEM

The recordkeeping system involves the use of three forms on which to record work-related injuries and illnesses: (1) a log of occupational injuries and illnesses; (2) a supplementary record of occupational injuries and illnesses; (3) a summary of occupational injuries and illnesses. None of these are report forms; all are to remain in the establishment and be available without delay at reasonable times for examination by representatives of the Department of Labor, the Department of Health, Education, and Welfare, or States operating under a section 18(b) plan. The records are to be retained in the establishment for 5 years following the end of the calendar year to which they relate.

Each recordable case of an occupational injury or illness must be entered on the log of occupational injuries and illnesses within 6 working days of receipt of information that an occupational illness or injury has occurred. This form contains columns for entering the date of injury (or of initial diagnosis of illness), occupation of injured or ill employee, department to which employee was assigned, nature of injury or illness, and part of body affected. Each case is also to be classified either as an injury or as one of the seven classes of illnesses. In the case of a fatality, the date of death is also entered. When cases involve



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1 or more workdays (but are nonfatal), the number of lost workdays is entered; nonfatal cases without lost workdays (for example, loss of consciousness) are indicated by a checkmark in the appropriate column. Hopefully, this breakdown will help eliminate the problem of underreporting of accidents that resulted in transfer or termination of employment before lost workdays occurred.

## LOCATION OF RECORDS

Another important new change concerns where records are kept. The regulations intend that records be kept at the lowest organizational level having the capability to keep them. This has a threefold purpose: (1) to provide records for the use of compliance officers near the point of operations; (2) to assure that the statistics resulting from these records accurately reflect the size and activity of the unit from which they came; and (3) to aid local management and labor in reviewing the occupational injury and illness experience of employees. In particular, the system is designed to avoid the pooling of information from large numbers of small establishments into company-wide reports.

The recordkeeping unit in this system is the establishment, which is defined as a single physical location where business is conducted or where services or industrial operations are performed. Distinctly separate activities, such as contract construction activities operating from the same physical location as a lumberyard, are to be treated as separate establishments. Firms that are physically dispersed, such as those in construction or communications, may maintain records at the place where employees report each day; but these records must be kept in such a way that they can be available without delay and at reasonable times for examination by compliance officers.

## PETITIONS FOR VARIANCE

An employer may wish to (1) define "establishment" in a different manner, or (2) keep records in a place other than the establishment, or (3) keep records different from those required in the regulations. A petitioning process exists for such exceptions.

The petition, which is made to the Regional Director of the Bureau of Labor Statistics for the region in which the establishment is located, must identify the establishment(s) for which an exception is sought, describe the proposed alternate procedure and the reasons for the proposed exception, and indicate that the employees concerned have been notified. Notification can be satisfied by giving a copy of the petition for exception to employees or their authorized representative, or by posting a statement summarizing the petition and specifying where a copy may be examined. The employees and their representatives must also be notified that they have 10 working days following receipt of notice to submit a written objection to the Regional Director of the Bureau of Labor Statistics.

If a Regional Director receives a petition from an employer with establishments beyond the boundary of his region, the petition must be referred to the BLS's Assistant Commissioner for Occupational Safety and Health Statistics in Washington, D.C.

The Regional Director or the Assistant Commissioner, as the case may be, may grant the petition for exception if he finds that the proposed procedure will provide equivalent information and will not interfere with the purposes of the Act. Notice of the grant of a petition must be published in the Federal Register.

## FEDERAL GOVERNMENT RECORDKEEPING

Section 19 of the Williams-Steiger Occupational Safety and Health Act of 1970 requires Federal agencies to conduct occupational safety and health programs consistent with the standards developed under the Act, including maintenance of adequate records of work injuries and illnesses and the preparation of periodic reports for submittal to the Secretary of Labor. Executive Order No. 11612, signed on July 26, 1971, further details the responsibilities and duties of heads of Federal agencies and the Secretary of Labor in the administration of the Act.

Required records and reports will include data on all Federal, civilian, and selected military (noncombat) employees whose salaries are paid from Federal funds. Data on foreign nationals employed outside the United States and private employees of Federal contractors are not to be included in these reports. Recording of data by Federal agencies was scheduled to begin January 1, 1972; the first quarterly report is to be submitted May 15, 1972, and the first annual report on February 15, 1973.

It is the goal of the Federal agency recordkeeping program to produce occupational safety and health data comparable to those from the private sector. Therefore, all Federal agencies were requested to use recordkeeping forms comparable with those introduced to the private sector.

## DATA COLLECTION SURVEYS

The Bureau of Labor Statistics, by delegation from the Secretary of Labor, has responsibility under the Williams-Steiger Act for conducting an annual national survey of occupational injuries and illness in cooperation with State agencies.

Recordkeeping regulations issued under the Act require all business establishments subject to the Act to maintain records of recordable occupational injuries and illness occuring on or after July 1, 1971. Recordkeeping requirements differ from State workmen's compensation requirements, but the Act does not supersede or in any way affect workmen's compensation laws.

To assist employers in complying with reporting and requirements, the Department of Labor has issued regulations specifying that upon receipt of an occupational injuries and illness survey an employer shall promptly complete and return the requested report form in accordance with its instructions. In States with cooperating programs, the survey reports will be returned to an indicated State agency address.

The surveys planned for collecting occupational injury and illness data will cover all nonagricultural industries (except mining and government) in all States and the District of Columbia, Guam, Puerto Rico, and the Virgin Islands. Excluded from the scope of the survey are self-employed individuals, employees covered by other Federal laws administered by other Federal agencies exercising their jurisdiction to promulgate occupational safety and health standards, and Federal, State, and local government employees. Agriculture will not be included in the 1971 and 1972 surveys; however, it is expected that the solution of recordkeeping and reporting problems in agriculture will permit coverage in future surveys.

About 50,000 establishments have been selected to furnish data under the new recordkeeping system covering injury and illness experience in the last 6 months of 1971. The sample for this period is designed to produce injury and illness data at most of the two-digit Standard Industrial Classification (SIC) industry levels for the country as a whole. Beginning with the 1972 survey, collection will be on an annual basis. The total national sample will be expanded in 1972 to approximately 200,000 reporting units to provide data at the four-digit SIC industry level in manufacturing and the three-digit level in nonmanufacturing. When the sample size is supplemented significantly in participating States, comparable State estimates will be possible. These sampling techniques will give valid data without requiring too great data processing costs or overburdening employees.

In February 1971, the Bureau of Labor Statistics conducted a "crossover-target industry survey." This was designed to compare the data collection system under the Z16.1 standard and the new occupational safety and health reporting definitions, and to aid in evaluating the effects of the Labor Department standards and enforcement activities in the target industries. However, the issuance of new Federal regulations covering reporting of occupational injuries and illnesses will alter the reporting environment and have an impact on the reliability of comparisons between the old and the new data collection systems.

The crossover sample will cover approximately 9,500 units in manufacturing and construction only. The sample is intended to yield estimates only at the national division level. The target industry sample will number about 5,000 units in industries selected by the Labor Department reporting injury data under the Z16.1 standard and which have had the worst accident experience over the years: roofing and sheet metal; meat and meat products; lumber and wood products; miscellaneous transportation equipment; and marine cargo handling, primarily longshoring activities. Establishments in marine cargo handling will not be requested to report data under the new definitions; data from the present quarterly survey forms covering only employment subjects to the Longshoremen's and Harbor Workers' Compensation Act will be utilized for purpose of this survey.

Excluding the marine cargo handling industry, data will be requested for the first and second halves of 1971. By assembling the data in 6-month periods for each industry and individual sample unit, comparisons can be made between injury rates in the first and second halves of the year 1971. In addition, collection of data under OSHA reporting regulations will provide a comparison

with reporting under Z16.1 for the latter half of 1971. Seasonal adjustment of work-injury and illness data will be explored in contemplated special studies of selected industries on a seasonal basis.

## OCCUPATIONAL INJURY AND ILLNESS RESEARCH

In addition to the annual program of compiling and analyzing data on the frequency and severity of work injuries, over the years BLS has engaged in a variety of research efforts. The major emphasis of these special studies has been concerned with obtaining in-depth information on the causal factors of industrial accidents and the nature of the resulting injuries. Some studies have produced detailed industry injury rate data, and others have focused on a particular piece of industrial equipment and the injuries associated with it.

Injury incidence surveys are important indicators of the general problem areas in industries; accident-cause studies, on the other hand, yield significant information on the specific aspects of accidents, which can help reduce or eliminate hazards. On the premise that work-related injuries can generally be avoided, accident-cause studies examine the accident as an event and isolate its components. The several accident-cause studies that have been conducted in various industries by the Bureau of Labor Statistics in the past have provided insight into the causal pattern of accidents and have indicated methods of preventing them.

Each causal study was confined to a single industry; data were obtained about the injured employee, the kinds and extent of injuries sustained, and details on the accident involved. The data were collected through personal visits to a sample of establishments selected on the basis of the number of injuries they reported. Information was gathered on the nature of the disabling injury, including the part of the body injured, accident type, activity of the injured worker, hazardous conditions, unsafe acts, worker's age, and sex.

The studies explored factors contributing to work accidents and suggested a number of correlations between injuries and economic variables. The studies also indicated that a combination of factors, rather than a single factor, was usually responsible for a particular accident. For example, *Causes in Hospitals* (*1968*), injuries from falls in the BLS study, *Work Injuries and Accident* were associated with wet, slippery floors, carrying of objects, inattention to footing, and loose objects on floors.

Possible relationships between high turnover rate or inexperience and high injury rates among workers, and between rising productivity and an increase in accident rates were noted. The studies were less successful, however, in pinpointing the effect of mechanization of industrial processes on work injuries. While machines were responsible for many injuries, a large number of accidents involved only manual operations. The conflicting conclusions presented in different studies suggested the difficulty of isolating the impact of automation or other technological innovations. Similarly, no definite geographical correlation with the pattern of injury rates was established. Where regional differentials did emerge, it was unclear whether the divergent patterns resulted from factors inherent to the region or from differences in reporting techniques and completeness of reports.

Valuable as these past studies were, their shortcomings were apparent. Employers' records often contained insufficient or unclear information, and the lack of uniformity in recordkeeping made comparability difficult.

Nevertheless, the experience gained from these special studies provides a good foundation for conducting similar research under the new OSHA recordkeeping system. Future accident causal pattern studies will have many advantages over past studies as a result of the Williams-Steiger Act.

Mandatory recordkeeping of work-related injuries should provide more consistent data. Another decided advantage is that the records maintained by employers must be made available for research as well as reporting and compliance purposes. Furthermore, expanded manpower resources in the field of safety and health research will make possible timely publication of the research findings, an important ingredient of the positive and effective program of accident prevention which the Williams-Steiger Act envisages.

## Chapter 9

# TRENDS IN WORK INJURIES, 1958–1970

Despite the shortcomings of the work-injury statistics collected under the American National Standards Institute Z16.1 method, for many years they were the primary source of information on work-related injuries. These data provided comparisons of work injuries among industries and helped identify particularly hazardous employment. Since the data have been compiled on a comparable basis, they were also useful for trend analysis of work injury experience among major industry and subindustry groups.

Major industries in the United States have exhibited wide variations in levels and trends of injury frequency rates during the 1958–70 period, reflecting to a large extent the nature of the industry itself. Not only did some industries characteristically have high rates and others low, but the trend of work injuries during this period has also differed substantially among the various industries. Between 1958 and 1970, injury frequency rates have moved up dramatically in the rubber and plastics industries, for example, while in textiles the increase has been appreciably smaller. On the other hand, several industries have shown actual declines in work injuries over this same period, notably the service industries. The rise in work injuries in many industries was particularly sharp after 1963, when the Nation's economy was responding to strong expansionary forces.

Major indicators such as gross national product, the index of industrial production, expenditures for new plant and equipment, productivity, and employment all reflected the heightened economic activity. Rising injury frequency rates have sometimes been associated with increases in output and employment, although the relationships have not always been clearly established. In addition, other developments may have influenced the pattern of work injuries during this period, such as the continuing transition from an agrarian to an industrial economy, the shift from blue-collar to white-collar employment, and the increasing importance of the service-producing sector vis-a-vis the goods-producing [1] sector.

*Manufacturing.*—In manufacturing, the injury frequency rate was 15.2 in 1970, one-third higher than the level of 11.4 registered in 1958 (see Table 3). The increase in injury frequency rates over the period may be attributed, in part, to the unusually low rates of the 1958 base year, which reflected that year's recession and the 1.2 million cutback in manufacturing employment. In 1958, 15 of the 21 major manufacturing subdivisions had their lowest frequency rates for the 13-year period.

Within the overall pattern of manufacturing, the frequency of work injuries has differed markedly between the durable goods and nondurable goods sectors. Differences in mechanization, product orientation, and production processes are important contributing factors. Although frequency rates have tended generally to be higher in the durable than in the nondurable goods industries, the increase in injury frequency in the 1958–70 period had been somewhat more rapid in nondurables. Employment, on the other hand, increased more rapidly in the durable goods (27 percent) than in the nondurable goods industries (15 percent) over the period.

The rising trend in injury frequency rates paralleled other relevant trends in manufacturing. Employment growth in all of manufacturing amounted to 3.5 million, or 21.5 percent, between

[1] Goods-producing industries include agriculture, mining, contract construction, and manufacturing; service-producing industries include transportation and public utilities, wholesale and retail trade, finance, insurance, and real estate, services, and government.

Table 3 Injury frequency rates in selected industries, 1958 and 1970

| Industries | 1958 | 1970 | Change | | 13-year average |
|---|---|---|---|---|---|
| | | | Rate | Percent | |
| Mining: | | | | | |
| Coal mining and preparation | [1] 42.5 | 41.6 | 0.9 | −2.1 | 43.0 |
| Metal mining and milling | [2] 23.6 | 23.7 | .1 | .4 | 23.0 |
| Nonmetal mining and milling | [3] 20.6 | 24.1 | 3.5 | 17.0 | 21.9 |
| Contract construction | 30.9 | 28.0 | −2.9 | −9.3 | 29.1 |
| Manufacturing | 11.4 | 15.2 | 3.8 | 33.3 | 12.9 |
| Durable goods: | | | | | |
| Ordnance and accessories | 3.1 | 9.8 | 6.7 | 216.1 | 3.8 |
| Lumber and wood products | 37.0 | 34.1 | −2.9 | 7.8 | 36.5 |
| Furniture and fixtures | 16.1 | 22.0 | 5.9 | 36.6 | 19.8 |
| Stone, clay, and glass products | 18.5 | 23.8 | 5.3 | 28.6 | 19.7 |
| Primary metal industries | 10.0 | 16.9 | 6.9 | 69.0 | 12.9 |
| Fabricated metal products | 14.5 | 22.4 | 7.9 | 54.5 | 18.0 |
| Machinery, except electrical | 9.8 | 14.0 | 4.2 | 42.8 | 11.9 |
| Electrical equipment | 4.9 | 8.1 | 3.2 | 65.3 | 6.1 |
| Transportation equipment | 6.0 | 7.9 | 1.9 | 31.6 | 6.7 |
| Instruments and related products | 5.5 | 7.9 | 2.4 | 43.6 | 6.6 |
| Miscellaneous manufacturing | 12.0 | 15.8 | 3.8 | 31.7 | 13.8 |
| Nondurable goods: | | | | | |
| Food and kindred products | 19.5 | 28.8 | 9.3 | 47.6 | 23.5 |
| Tobacco manufactures | 7.8 | 11.9 | 4.1 | 52.6 | 9.0 |
| Textile mill products | 9.0 | 10.4 | 1.4 | 15.6 | 9.7 |
| Apparel and related products | 6.0 | 7.7 | 1.7 | 28.3 | 6.8 |
| Paper and allied products | 11.4 | 13.9 | 2.5 | 21.9 | 13.1 |
| Printing and publishing | 8.8 | 11.7 | 2.9 | 32.9 | 10.1 |
| Chemicals and allied products | 7.5 | 8.5 | 1.0 | 13.3 | 7.7 |
| Petroleum and coal products | 6.7 | 11.3 | 4.6 | 68.6 | 8.4 |
| Rubber and plastics products | 8.7 | 18.6 | 9.9 | 113.7 | 12.8 |
| Leather and leather products | 10.9 | 15.2 | 4.3 | 39.5 | 13.3 |
| Transportation and public utilities: | | | | | |
| Local and interurban passenger transit | 13.3 | 23.9 | 10.6 | 79.7 | 17.9 |
| Motor freight transportation and warehousing | 28.9 | 35.3 | 6.4 | 22.1 | 31.8 |
| Communication | .9 | 2.5 | 1.6 | 177.7 | 1.3 |
| Electric, gas, and sanitary services | 6.3 | 6.6 | .3 | 4.7 | 5.9 |
| Wholesale and retail trade | [3] 13.0 | 11.3 | −1.7 | −13.0 | 11.8 |
| Finance, insurance, and real estate: | | | | | |
| Banking | 2.3 | 2.4 | .1 | 4.3 | 2.3 |
| Insurance carriers | 2.2 | 2.6 | .4 | 18.2 | 2.3 |
| Real estate | 12.0 | 11.4 | −.6 | −5.0 | 12.0 |
| Services: | | | | | |
| Personal services | 8.3 | 7.8 | −.5 | −6.0 | 8.6 |
| Miscellaneous business services | 8.8 | 6.0 | −2.8 | 31.8 | 7.7 |
| Auto repair, services, and garages | 16.9 | 14.3 | −2.6 | −15.3 | 15.0 |
| Medical and other health services | 8.1 | 9.3 | 1.2 | 14.8 | 8.3 |

[1] Rate not available for 1958; base year is 1960.
[2] Rate not available for 1958; base year is 1962.
[3] Rate not available for 1958; base year is 1961.

1958 and 1970. Above-average employment increases occurred in 10 manufacturing industry subdivisions, seven of which also posted increases in injury frequency above the all-manufacturing average rate increase of 33 percent.

Hiring activity over the period had also been brisk. New hires in factories averaged 28 per 1,000 employees in 1970, compared with 17 per 1,000 in 1958. In specific industries, rates had doubled over the period. Although many workers were hired to replace those who had either quit their jobs, retired from the workforce, or had died, others were recruited to satisfy the additional manpower needs of employers for increased production. Much labor turnover entails the acquisition of inexperienced personnel who may be unfamiliar with established

Table 4 Injury severity rates in selected industries, 1958 and 1970

| Industries | 1958 | 1970 | Change | | 13-year average |
|---|---|---|---|---|---|
| | | | Rate | Percent | |
| Mining | | | | | |
| Coal mining and preparation | [1] 9, 170 | 7, 792 | −1, 378 | −15. 0 | 8, 573 |
| Metal mining and milling | [2] 4, 147 | 3, 238 | −909 | −21. 9 | 3, 586 |
| Nonmetal mining and milling | [2] 2, 244 | 2, 624 | 380 | 16. 9 | 2, 514 |
| Contract construction | 2, 496 | 2, 100 | −396 | −15. 8 | 2, 307 |
| Manufacturing | 761 | 759 | −2 | −. 3 | 719 |
| Durable goods: | | | | | |
| Ordnance and accessories | 198 | 284 | 86 | 43. 4 | 283 |
| Lumber and wood products | 3, 050 | 2, 891 | −159 | −5. 2 | 2, 932 |
| Furniture and fixtures | 1, 000 | 909 | −91 | −9. 1 | 887 |
| Stone, clay, and glass products | 1, 364 | 1, 540 | 176 | 12. 9 | 1, 395 |
| Primary metal industries | 1, 035 | 1, 128 | 93 | 8. 9 | 1, 001 |
| Fabricated metal products | 1, 023 | 1, 003 | −20 | −1. 9 | 922 |
| Machinery, except electrical | 525 | 583 | 58 | 11. 0 | 573 |
| Electrical equipment | 282 | 333 | 51 | 18. 1 | 282 |
| Transportation equipment | 479 | 488 | 9 | 1. 8 | 447 |
| Instruments and related products | 261 | 270 | 9 | 3. 4 | 274 |
| Miscellaneous manufacturing | 595 | 561 | −34 | −5. 7 | 585 |
| Nondurable goods: | | | | | |
| Food and kindred products | 1, 009 | 1, 156 | −147 | −14. 5 | 1, 031 |
| Tobacco manufactures | 249 | 332 | 83 | 33. 3 | 306 |
| Textile mill products | 550 | 579 | 29 | 5. 3 | 514 |
| Apparel and related products | 231 | 207 | −24 | −10. 3 | 166 |
| Paper and allied products | 993 | 937 | −56 | −5. 6 | 875 |
| Printing and publishing | 361 | 411 | 50 | 13. 9 | 414 |
| Chemicals and allied products | 741 | 562 | −179 | −24. 1 | 621 |
| Petroleum and coal products | 829 | 1, 116 | 87 | 34 6 | 887 |
| Rubber and plastics products | 549 | 895 | 346 | 63. 0 | 739 |
| Leather and leather products | 433 | 534 | 101 | 23. 3 | 441 |
| Transportation and public utilities: | | | | | |
| Local and interurban passenger transit | 604 | 1, 000 | 396 | 65. 5 | 957 |
| Motor freight transportation and warehousing | 1, 732 | 2, 311 | 579 | 33. 4 | 1, 928 |
| Communication | 88 | 235 | 147 | 167. 0 | 122 |
| Electric, gas, and sanitary services | 977 | 813 | −164 | −16. 7 | 879 |
| Wholesale and retail trade | [3] 553 | 452 | 101 | −18. 2 | 482 |
| Finance, insurance, and real estate: | | | | | |
| Banking | [3] 73 | 88 | 15 | 20. 5 | 119 |
| Insurance carriers | [3] 178 | 137 | −41 | 23. 0 | 167 |
| Real estate | [4] 763 | 341 | −422 | −55. 3 | 504 |
| Services: | | | | | |
| Personal services | 475 | 276 | −199 | −41. 8 | 430 |
| Miscellaneous business services | 563 | 310 | −253 | −44. 9 | 499 |
| Auto repair, services, and garages | 1, 005 | 427 | −578 | 57. 5 | 789 |
| Medical and other health services | 264 | 264 | 0 | 0 | 251 |

[1] Rate not available for 1958; base year is 1960.
[2] Rate not available for 1958; base year is 1962.
[3] Rate not available for 1958; base year is 1961.
[4] Data available only for 1968 through 1970.

work routines in their particular plants or at new jobs.

In contrast, average weekly hours of production workers in manufacturing did not change appreciably over the 1958–70 period. The workweek increased by about one-half hour during this time, due mostly to increased overtime hours in several industries.

*Other goods-producing industries.*—The hazards associated with mining are well known. Injury frequency rates, particularly in coal and metal mining, were among the highest of all industries. In coal mining, the frequency rate averaged about 43 injuries per million employee-hours worked in the 11-year period for which data were available (1960–70). In contrast, the frequency

rate in metal mining averaged about half that in coal between 1962 and 1970, the period for which comparable figures are available. Over their respective time periods, rates in both these mining industries have changed little.

In contract construction, injury frequency rates during the 1958–70 period averaged 29 per million employee-hours worked, more than double that for manufacturing. Over the 13-year span, injury frequency declined slightly despite rising employment levels and increasing mechanization.

*Service-producing industries (except government).*[2]—By way of contrast, industries in the service-producing sector generally average much lower injury frequency rates over the period. This was particularly true of the finance and services industries. However, isolated industries, such as motor freight transportation and warehousing, reflected an exceptionally high incidence of injuries in the 1958–70 period.

*Injury severity rates in major industries.*—Disability involving worktime lost represents a major barrier to employment that often imposes serious personal and economic consequences on the injured. Injury severity rates, expressed as the number of days of disability per million employee-hours worked, were used to measure this aspect of occupational injuries in the Nation's workplaces.

Several manufacturing industries reflected the prevalence of extremely serious accidents. In lumber and wood products, for example, the severity rate averaged 2,900 days lost per million employee-hours worked over the 1958–70 period, about four times the average for manufacturing (719) (see Table 4). Three other manufacturing industries—primary metals, fabricated metals, and food and kindred products—have averaged about 1,000 days lost per million employee-hours worked in the 13-year period.

Even higher severity rates, however, exist in mining, particularly coal mining. Over the 1958–70 period, about 8,500 days per million employee-hours worked were lost each year through serious injuries and fatalities to the Nation's coalworkers. (It should be noted that under the Z16.1 standard a fixed charge of 6,000 man-days lost was ascribed to each fatality.)

In contract construction, work injuries have also tended to be serious. Severity rates have ranged from a low of 1,992 to a high of 2,643 during the 1958–70 period. In other nonmanufacturing industries, the severity of accidents and injuries was generally less alarming.

Table 5 Analysis of injury severity rates in selected industries, 1963–1970

| | Percent of injuries resulting in permanent disability or death | | Percent change |
|---|---|---|---|
| | 1963 [1] | 1970 | |
| Manufacturing total | 5.3 | 4.6 | −13.2 |
| Rubber and plastics | 7.5 | 4.6 | −38.7 |
| Petroleum and coal products | 4.8 | 3.1 | −35.4 |
| Primary metal industries | 7.4 | 4.9 | −33.8 |
| Stone, clay and glass | 5.0 | 3.7 | −26.0 |
| Electrical equipment and supplies | 7.1 | 5.5 | −22.5 |
| Chemicals and allied products | 5.1 | 4.2 | −18.8 |
| Furniture and fixtures | 7.2 | 5.9 | −18.1 |
| Machinery, except electrical | 6.7 | 5.5 | −17.9 |
| Fabricated metal products | 6.0 | 5.0 | −16.7 |
| Instruments and related products | 8.2 | 6.1 | −13.4 |
| Miscellaneous manufacturing industries | 5.7 | 5.0 | −12.3 |
| Paper and allied products | 6.7 | 6.2 | −7.5 |
| Food and kindred | 3.4 | 3.2 | −5.9 |
| Apparel and other textile | 2.1 | 2.0 | −4.8 |
| Transportation equipment | 5.8 | 5.6 | −3.4 |
| Chemicals and allied products | 3.6 | 3.6 | |
| Leather and leather products | 3.6 | 3.6 | |
| Textile mill products | 5.9 | 6.1 | 3.4 |
| Ordnance and accessories | 4.6 | 5.1 | 10.9 |
| Lumber and wood products | 5.1 | 5.7 | 11.8 |
| Tobacco manufactures | NA | 4.2 | |

[1] Earliest available data.
NA=Not available.

The work-injury data suggest that substantially more progress was made in reducing the severity than the frequency of industrial injuries over the 1958–70 period, since the relative rise in severity rates was much smaller than that for frequency rates. Moreover, more industries (17) registered declines in severity rates than in frequency rates (7), reflecting reductions in the proportion of injuries resulting in either death or permanent impairment. Table 5 illustrates the declining proportion of critical injuries in most manufacturing industries.

Unlike frequency rates, severity rates are highly unstable and fluctuate greatly from year to year. In some industries severity rates parallel patterns

[2] With the exception of trade, lack of sufficient number of reports precludes aggregation of frequency data for the broad industry groupings among other major service-producing industries.

in frequency rates and in other industries they diverge from such patterns. For example, the five industries in durables manufacturing with consistently high frequency rates over the 1958–70 period—lumber and wood products, furniture and fixtures, stone, clay and glass products, primary metals, and fabricated metals—have also had high severity rates. The same holds true for contract construction. In contrast, leather and leather products had relatively high frequency rates throughout the period but relatively low severity rates.

## STATE WORK-INJURY TRENDS IN MANUFACTURING

Among the 14 selected States that have consistently reported work injuries under the Z16.1 method to the Bureau of Labor Statistics over the years, work-injury rates have varied widely, reflecting differences in industrial structure and in State workmen's compensation laws, among other factors. The relatively consistent series available for these selected States in the cooperative program began in 1964.

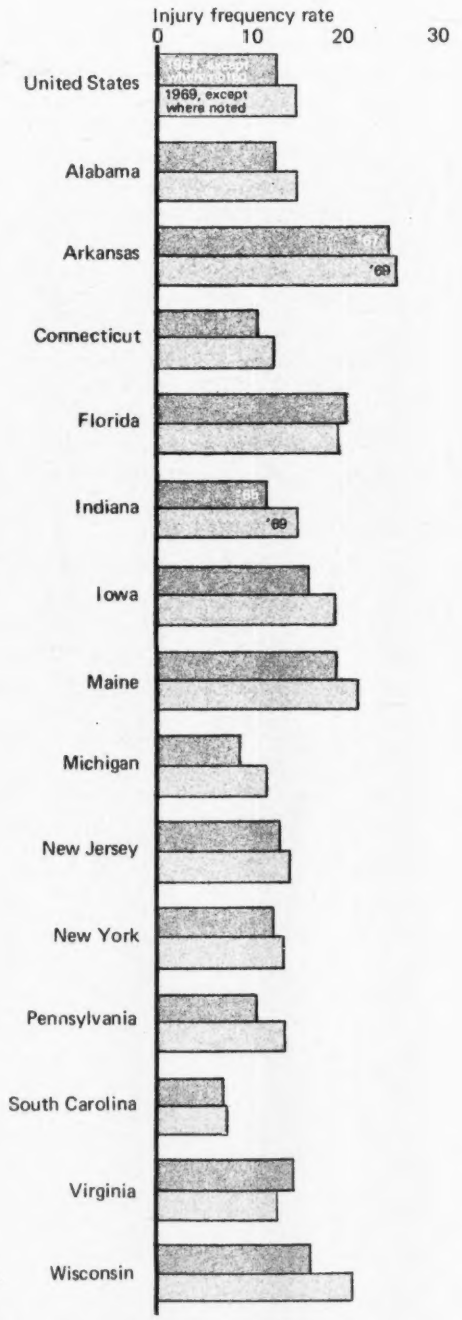
Overall, six of the 14 States—Connecticut, Indiana, Michigan, New York, Pennsylvania, and South Carolina—had manufacturing injury frequency rates below the national average of 13.0 for the years 1964 through 1969, the latest year for which most States have published data (see Chart 20). Rates in the remaining eight States exceeded that for the Nation, with the highest recorded in Arkansas—about 25 per million employee-hours worked. South Carolina had the lowest average frequency rate in manufacturing, slightly over 7 per million employee-hours worked.

Between 1964 and 1969, the frequency of injuries rose in all States except Florida and Virginia. The relative change over this period ranged from a decline of nearly 10 percent in Virginia to an increase of 32 percent in Indiana. However, only four States had registered percentage increases higher than the national increase of 20 percent for the 6-year period.

Compared with the Nation as a whole, the selected States averaged fewer industry increases in injury-frequency rates in both durables and nondurables in the 1964–69 period. In the selected States as a group, injury-frequency rates rose in seven of the 11 durable goods industries and in eight of the 10 nondurable goods industries over the 6-year period; in the Nation as a whole, rates were higher in all but one of the 11 durable goods

CHART 20

**Injury Frequency Rates in Manufacturing for Selected States, 1964 and 1969**




Source: Department of Labor.

industry groups and in each of the 10 nondurable industries.

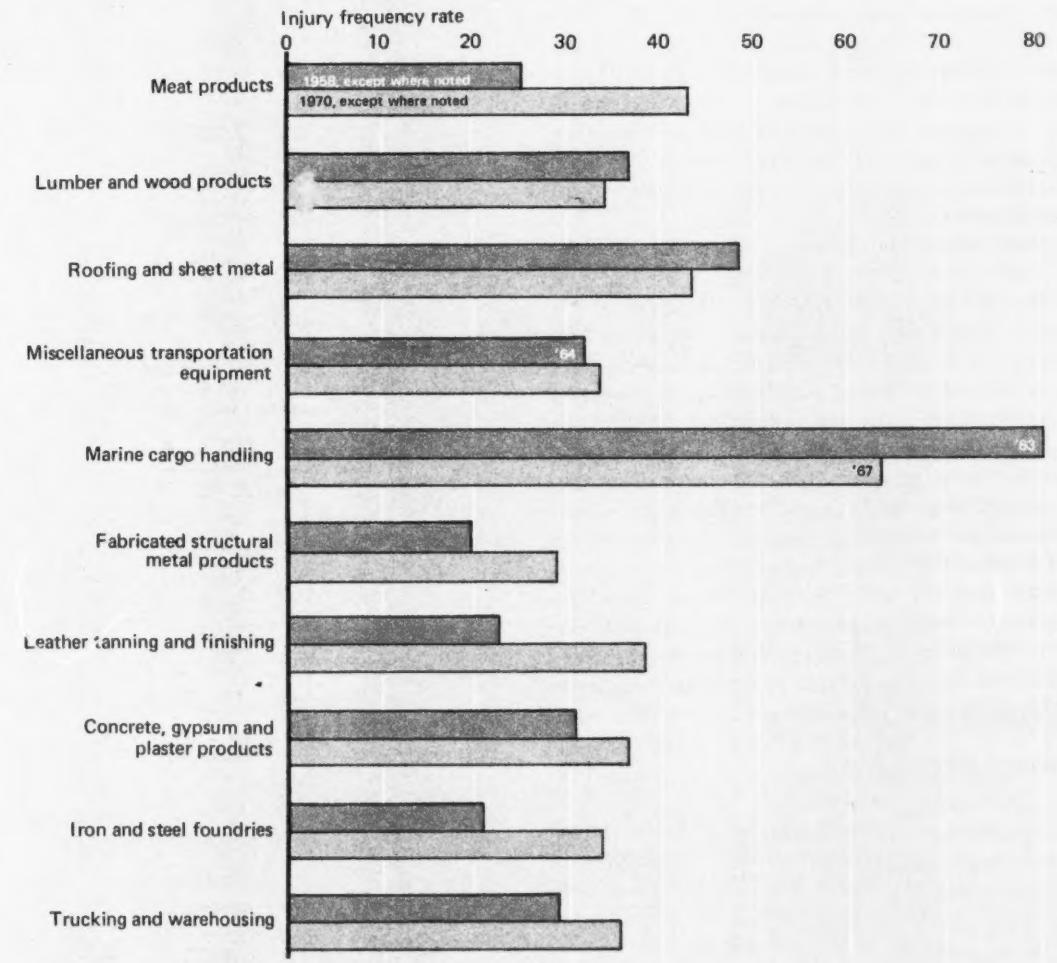
The relatively high levels of manufacturing injuries in these States, when viewed along with the generally rising trend over a period of time, have helped to channel public attention toward improved safety for workers in all States. Despite the fact that individual States have different types of safety and health problems, new recording and reporting provisions under the Act will help the States to evaluate these problems more thoroughly and to reach appropriate solutions with the help of Federal grants-in-aid.

## HIGH AND LOW FREQUENCY RATE INDUSTRIES

For the purpose of comparison, 10 industries with high injury-frequency rates and 10 with rel-

CHART 21

**Injury Rates in Selected High Frequency Industries, 1958 and 1970**




Source: Department of Labor.

atively low injury-frequency rates were identified. Rather striking reltaionships are seen when selected characteristics for the former are compared with those of the latter. Although workers in the 10 high frequency rate industries averaged the same number of weekly hours as those in the 10 low frequency industries in 1970, average weekly earnings were about $3 higher for the latter. These averages, however, mask significant differences among the individual industries. For example, workers in the apparel and accessory stores industry (low frequency) averaged $72.09 in weekly pay, and worked an average of 31.9 hours per week; in contrast, workers in the roofing and sheet metal industry (high frequency) averaged $164.50 in weekly pay, and worked 33.3 hours per week.

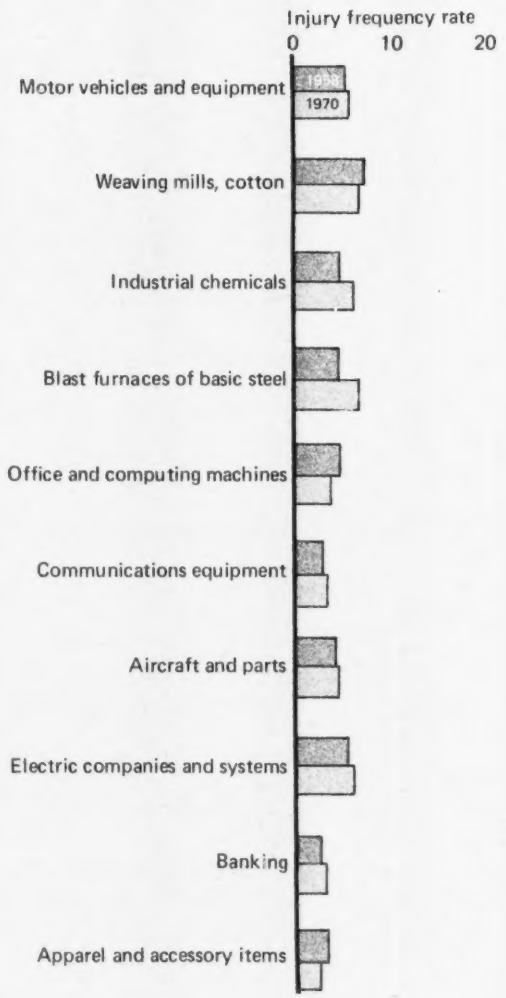
| | 1970 | |
|---|---|---|
| | 10 high frequency industries | 10 low frequency industries |
| Average weekly earnings | $140. 16 | $143. 02 |
| Average weekly hours | 39. 7 | 39. 7 |

When average weekly pay in the 10 high frequency rate industries for 1970 is compared with that for workers in the 10 low frequency industries, the differential appears to counter the once acceptable "assumption-of-risk theory," which presupposed that higher pay was adequate compensation for greater risk.

The high injury-frequency rate industries tended to have larger proportions of production and nonsupervisory workers. Production workers accounted for more than four-fifths of total employment in seven of the 10, while comparable proportions were found in only four of the 10 industries in the low-frequency group. The frequency of injuries generally is considered to be higher among workers directly involved in the production process.

CHART 22

**Injury Rates in Selected Low Frequency Industries, 1958 and 1970**




Source: Department of Labor.

# APPENDICES

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The Department of Labor is the source of all data in the appendices unless otherwise specified.

# A. ESTIMATES OF ESTABLISHMENT AND EMPLOYMENT COVERAGE

TABLE A–1.—*Establishment Coverage*

[Estimated number of establishments in the private sector covered by the Williams-Steiger Occupational Safety and Health Act of 1970—total and the targe industries [1] by OSHA region and State—July 1971]

| OSHA Region and State | Number of covered establishments | | | | | | |
|---|---|---|---|---|---|---|---|
| | All establishments (in thousands) | Establishments in the target industires [2] | | | | | |
| | | Total | Roofing and sheet metal (SIC–176) | Meat and meat products (SIC–201) | Miscellaneous transportation equipment (SIC–379) | Lumber and wood products (SIC–24) | Longshoring (SIC–4463) |
| All regions | 4, 957. 5 | 70, 205 | 35, 860 | 4, 165 | 2, 050 | 27, 400 | 730 |
| Boston region | 286. 7 | 4, 145 | 2, 180 | 145 | 10 | 1, 775 | 35 |
| Connecticut | 72. 3 | 755 | 610 | 25 | ---------- | 115 | 5 |
| Maine | 26. 6 | 1, 020 | 135 | 20 | ---------- | 860 | 5 |
| Massachusetts | 130. 8 | 1, 450 | 1, 020 | 75 | 10 | 325 | 20 |
| New Hampshire | 20. 2 | 375 | 115 | 10 | ---------- | 250 | ---------- |
| Rhode Island | 23. 0 | 280 | 225 | 15 | ---------- | 35 | 5 |
| Vermont | 13. 8 | 265 | 75 | ---------- | ---------- | 190 | ---------- |
| New York region | 635. 4 | 6, 475 | 4, 785 | 350 | 30 | 1, 205 | 105 |
| New Jersey | 162. 2 | 2, 015 | 1, 615 | 90 | 10 | 270 | 30 |
| New York | 447. 8 | 4, 310 | 3, 095 | 245 | 20 | 895 | 55 |
| Puerto Rico | 25. 4 | 150 | 75 | 15 | ---------- | 40 | 20 |
| Philadelphia region | 491. 7 | 8, 430 | 4, 670 | 465 | 125 | 3, 090 | 80 |
| Delaware | 11. 8 | 205 | 155 | 15 | ---------- | 30 | 5 |
| District of Columbia | 19. 1 | 90 | 80 | ---------- | ---------- | 10 | ---------- |
| Maryland | 71. 4 | 1, 115 | 770 | 65 | 5 | 250 | 25 |
| Pennsylvania | 251. 7 | 4, 005 | 2, 545 | 280 | 95 | 1, 055 | 30 |
| Virginia | 98. 7 | 2, 305 | 905 | 70 | 20 | 1, 290 | 20 |
| West Virginia | 39. 0 | 710 | 215 | 35 | 5 | 455 | ---------- |
| Atlanta region | 785. 3 | 16, 015 | 5, 950 | 710 | 385 | 8, 830 | 140 |
| Alabama | 75. 6 | 2, 160 | 460 | 80 | 35 | 1, 570 | 15 |
| Florida | 167. 2 | 3, 025 | 1, 895 | 70 | 115 | 885 | 60 |
| Georgia | 109. 0 | 2, 820 | 840 | 145 | 100 | 1, 725 | 10 |
| Kentucky | 88. 6 | 1, 000 | 485 | 70 | 10 | 420 | 15 |
| Mississippi | 54. 2 | 1, 235 | 350 | 70 | 15 | 795 | 5 |
| North Carolina | 129. 5 | 2, 805 | 900 | 150 | 50 | 1, 695 | 10 |
| South Carolina | 57. 5 | 1, 430 | 365 | 45 | 30 | 985 | 5 |
| Tennessee | 103. 7 | 1, 540 | 655 | 80 | 30 | 755 | 20 |
| Chicago region | 1, 005. 3 | 12, 045 | 6, 940 | 950 | 535 | 3, 520 | 100 |
| Illinois | 257. 9 | 2, 435 | 1, 655 | 230 | 30 | 490 | 30 |
| Indiana | 123. 0 | 1, 590 | 850 | 120 | 215 | 405 | ---------- |
| Michigan | 175. 2 | 2, 645 | 1, 460 | 170 | 120 | 880 | 15 |
| Minnesota | 100. 7 | 1, 040 | 440 | 85 | 50 | 450 | 15 |
| Ohio | 233. 3 | 2, 705 | 1, 765 | 230 | 75 | 605 | 30 |
| Wisconsin | 115. 2 | 1, 630 | 770 | 115 | 45 | 690 | 10 |
| Dallas region | 533. 5 | 7, 185 | 3, 580 | 505 | 260 | 2, 710 | 130 |
| Arkansas | 53. 4 | 1, 290 | 350 | 70 | 35 | 820 | 15 |
| Louisiana | 78. 2 | 1, 620 | 700 | 75 | 20 | 775 | 50 |
| New Mexico | 24. 5 | 240 | 150 | 20 | ---------- | 70 | ---------- |
| Oklahoma | 77. 2 | 665 | 440 | 70 | 40 | 115 | ---------- |
| Texas | 300. 2 | 3, 370 | 1, 940 | 270 | 165 | 930 | 65 |

See footnotes at end of table.

TABLE A–1.—*Establishment Coverage*—Continued

| OSHA Region and State | Number of covered establishments | | | | | | |
|---|---|---|---|---|---|---|---|
| | All establishments (in thousands) | Establishments in the target industries [2] | | | | | |
| | | Total | Roofing and sheet metal (SIC–176) | Meat and meat products (SIC–201) | Miscellaneous transportation equipment (SIC–379) | Lumber and wood products (SIC–24) | Longshoring (SIC–4463) |
| Kansas City region | 360. 9 | 3, 065 | 1, 675 | 400 | 190 | 780 | 20 |
| Iowa | 101. 4 | 725 | 440 | 105 | 45 | 135 | ---------- |
| Kansas | 74. 4 | 590 | 365 | 75 | 80 | 70 | ---------- |
| Missouri | 131. 8 | 1, 360 | 645 | 130 | 40 | 525 | 20 |
| Nebraska | 53. 3 | 390 | 225 | 90 | 25 | 50 | ---------- |
| Denver region | 172. 8 | 1, 775 | 900 | 175 | 65 | 635 | ---------- |
| Colorado | 60. 8 | 650 | 400 | 65 | 30 | 155 | ---------- |
| Montana | 23. 5 | 420 | 90 | 25 | 5 | 300 | ---------- |
| North Dakota | 24. 3 | 110 | 80 | 15 | ---------- | 15 | ---------- |
| South Dakota | 25. 5 | 140 | 75 | 20 | 10 | 35 | ---------- |
| Utah | 26. 2 | 330 | 205 | 40 | 20 | 65 | ---------- |
| Wyoming | 12. 5 | 125 | 50 | 10 | ---------- | 65 | ---------- |
| San Francisco region | 511. 4 | 6, 090 | 3, 790 | 300 | 335 | 1, 610 | 55 |
| Arizona | 37. 3 | 485 | 325 | 20 | 35 | 105 | ---------- |
| California | 446. 6 | 5, 305 | 3, 230 | 265 | 300 | 1, 460 | 50 |
| Hawaii | 14. 7 | 180 | 135 | 15 | ---------- | 25 | 5 |
| Nevada | 12. 8 | 120 | 100 | ---------- | ---------- | 20 | ---------- |
| Seattle region | 174. 5 | 4, 980 | 1, 390 | 165 | 115 | 3, 245 | 65 |
| Alaska | 6. 2 | 130 | 50 | ---------- | ---------- | 65 | 15 |
| Idaho | 24. 0 | 545 | 120 | 30 | 30 | 365 | ---------- |
| Oregon | 59. 2 | 2, 095 | 460 | 65 | 55 | 1, 495 | 20 |
| Washington | 85. 1 | 2, 210 | 760 | 70 | 30 | 1, 320 | 30 |

[1] These estimates include approximately 1.9 million employees in approximately 120,000 establishments where working conditions may be subject to safety or health standards or regulations of other Federal agencies. Under section 4(b) (1) of the Williams-Steiger Occupational Safety and Health Act of 1970, the standards of the OSH Act do not apply to the extent other Federal agencies "exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health." OSHA standards, therefore, may not apply or may apply only over certain working conditions in establishments regulated by the Atomic Energy Commission and in the mining and transportation industries.

[2] Rounded to the nearest 5 establishments.

## TABLE A–2.—*Employment Coverage*

[Estimated number of employees in the private sector employed in establishments covered by the Williams-Steiger Occupational Safety and Health Act of 1970—total and the target industries [1] by OSHA region and State July 1971—In Thousands]

| OSHA region and State | Number of employees in covered establishments | | | | | | |
|---|---|---|---|---|---|---|---|
| | All employees | Employees in the target industries | | | | | |
| | | Total | Roofing and sheet metal (SIC–176) | Meat and meat products (SIC–201) | Miscellaneous transport equipment (SIC–379) | Lumber and wood products (SIC–24) | Longshoring (SIC–4463) |
| All regions | 59, 781. 4 | 1, 295. 7 | 114. 6 | 356. 2 | 115. 6 | 597. 1 | 112. 2 |
| Boston region | 3, 846. 5 | 49. 7 | 6. 7 | 8. 8 | 0. 2 | 30. 8 | 3. 2 |
| Connecticut | 1, 021. 7 | 5. 4 | 2. 2 | 0. 9 | ---- | 1. 9 | 0. 4 |
| Maine | 272. 7 | 17. 7 | 0. 5 | 2. 7 | ---- | 14. 3 | 0. 2 |
| Massachusetts | 1, 908. 9 | 16. 1 | 2. 9 | 4. 4 | 0. 2 | 6. 4 | 2. 2 |
| New Hampshire | 230. 5 | 5. 6 | 0. 3 | 0. 6 | ---- | 4. 7 | ---- |
| Rhode Island | 282. 1 | 1. 7 | 0. 6 | 0. 2 | ---- | 0. 5 | 0. 4 |
| Vermont | 130. 6 | 3. 2 | 0. 2 | ---- | ---- | 3. 0 | ---- |
| New York region | 8, 598. 1 | 82. 9 | 13. 3 | 17. 6 | 0. 7 | 22. 2 | 29. 1 |
| New Jersey | 2, 252. 3 | 24. 0 | 3. 9 | 5. 5 | 0. 3 | 5. 7 | 8. 6 |
| New York | 5, 888. 8 | 53. 4 | 9. 1 | 11. 6 | 0. 4 | 15. 8 | 16. 5 |
| Puerto Rico | 457. 0 | 5. 5 | 0. 3 | 0. 5 | ---- | 0. 7 | 4. 0 |
| Philadelphia region | 6, 953. 7 | 131. 2 | 14. 5 | 41. 3 | 8. 1 | 50. 2 | 17. 1 |
| Delaware | 181. 7 | 4. 9 | 0. 7 | 3. 3 | ---- | 0. 6 | 0. 3 |
| District of Columbia | 331. 3 | . 7 | 0. 4 | ---- | ---- | 0. 3 | ---- |
| Maryland | 1, 088. 4 | 25. 0 | 2. 8 | 9. 8 | 0. 9 | 5. 2 | 6. 3 |
| Pennsylvania | 3, 666. 0 | 51. 9 | 6. 4 | 17. 0 | 5. 7 | 15. 6 | 7. 2 |
| Virginia | 1, 254. 6 | 40. 6 | 3. 5 | 10. 2 | 1. 2 | 22. 4 | 3. 3 |
| West Virginia | 431. 7 | 8. 1 | 0. 7 | 1. 0 | 0. 3 | 6. 1 | ---- |
| Atlanta region | 8, 733. 1 | 281. 7 | 21. 5 | 68. 2 | 25. 4 | 153. 6 | 13. 0 |
| Alabama | 817. 7 | 40. 5 | 1. 6 | 9. 1 | 3. 2 | 23. 6 | 3. 0 |
| Florida | 1, 802. 0 | 37. 1 | 7. 4 | 5. 3 | 5. 8 | 14. 1 | 4. 5 |
| Georgia | 1, 257. 9 | 52. 9 | 2. 8 | 16. 8 | 7. 8 | 24. 1 | 1. 4 |
| Kentucky | 787. 6 | 15. 1 | 1. 3 | 3. 9 | 0. 9 | 8. 8 | 0. 2 |
| Mississippi | 500. 5 | 35. 3 | 1. 0 | 9. 4 | 1. 2 | 22. 8 | 0. 9 |
| North Carolina | 1, 676. 2 | 50. 4 | 3. 5 | 13. 3 | 3. 6 | 28. 3 | 1. 7 |
| South Carolina | 732. 3 | 21. 6 | 1. 4 | 3. 0 | 1. 8 | 14. 3 | 1. 1 |
| Tennessee | 1, 158. 9 | 28. 8 | 2. 5 | 7. 4 | 1. 1 | 17. 6 | . 02 |
| Chicago region | 13, 391. 0 | 210. 4 | 24. 6 | 77. 6 | 30. 1 | 75. 3 | 2. 8 |
| Illinois | 3, 672. 4 | 39. 2 | 6. 0 | 18. 9 | 0. 4 | 12. 9 | 1. 0 |
| Indiana | 1, 554. 6 | 39. 3 | 3. 3 | 9. 3 | 14. 4 | 12. 3 | ---- |
| Michigan | 2, 455. 8 | 30. 4 | 4. 9 | 6. 4 | 5. 7 | 12. 9 | 0. 5 |
| Minnesota | 1, 120. 7 | 30. 5 | 2. 1 | 17. 6 | 2. 4 | 8. 1 | 0. 3 |
| Ohio | 3, 292. 1 | 36. 6 | 6. 0 | 13. 4 | 4. 3 | 12. 1 | 0. 8 |
| Wisconsin | 1, 295. 4 | 34. 4 | 2. 3 | 12. 0 | 2. 9 | 17. 0 | 0. 2 |

Footnote at end of table.

TABLE A-2.—*Employment Coverage*—Continued

| OSHA region and State | Number of employees in covered establishments | | | | | | |
|---|---|---|---|---|---|---|---|
| | All employees | Employees in the target industries | | | | | |
| | | Total | Roofing and sheet metal (SIC-176) | Meat and meat products (SIC-201) | Miscellaneous transport equipment (SIC-379) | Lumber and wood products (SIC-24) | Longshoring (SIC-4463) |
| Dallas region | 5,307.9 | 155.6 | 11.4 | 41.1 | 13.2 | 64.3 | 25.6 |
| Arkansas | 532.7 | 37.0 | 0.9 | 12.7 | 2.1 | 21.3 | [2] |
| Louisiana | 859.9 | 35.8 | 2.0 | 4.1 | 0.8 | 15.4 | 13.5 |
| New Mexico | 218.0 | 4.1 | 0.6 | 1.0 | ---- | 2.5 | ---- |
| Oklahoma | 608.5 | 7.9 | 1.2 | 3.4 | 1.1 | 2.2 | ---- |
| Texas | 3,088.8 | 70.8 | 6.7 | 19.9 | 9.2 | 22.9 | 12.1 |
| Kansas City region | 3,135.0 | 93.7 | 5.6 | 62.2 | 10.8 | 14.7 | 0.4 |
| Iowa | 771.1 | 37.0 | 1.2 | 29.8 | 2.1 | 3.9 | ---- |
| Kansas | 555.3 | 14.7 | 1.1 | 7.8 | 4.7 | 1.1 | ---- |
| Missouri | 1,391.0 | 25.1 | 2.5 | 11.9 | 1.8 | 8.5 | 0.4 |
| Nebraska | 417.6 | 16.9 | 0.8 | 12.7 | 2.2 | 1.2 | ---- |
| Denver region | 1,450.7 | 32.1 | 1.9 | 13.4 | 2.5 | 14.3 | ---- |
| Colorado | 624.7 | 10.1 | 0.9 | 5.5 | 1.0 | 2.7 | ---- |
| Montana | 175.5 | 9.7 | 0.1 | 0.9 | 0.2 | 8.5 | ---- |
| North Dakota | 144.7 | 0.7 | 0.2 | 0.4 | ---- | 0.1 | ---- |
| South Dakota | 140.9 | 6.4 | 0.1 | 5.1 | 0.5 | 0.7 | ---- |
| Utah | 269.9 | 3.8 | 0.5 | 1.4 | 0.8 | 1.1 | ---- |
| Wyoming | 95.0 | 1.4 | 0.1 | 0.1 | ---- | 1.2 | ---- |
| San Francisco region | 6,613.3 | 114.6 | 11.9 | 19.4 | 17.9 | 51.8 | 13.6 |
| Arizona | 449.2 | 6.5 | 1.3 | 1.3 | 0.7 | 3.2 | ---- |
| California | 5,738.7 | 104.1 | 9.5 | 17.6 | 17.2 | 47.6 | 12.2 |
| Hawaii | 247.3 | 3.6 | 0.9 | 0.5 | ---- | 0.8 | 1.4 |
| Nevada | 178.1 | 0.4 | 0.2 | ---- | ---- | 0.2 | ---- |
| Seattle region | 1,752.1 | 143.8 | 3.2 | 6.6 | 6.7 | 119.9 | 7.4 |
| Alaska | 69.5 | 2.0 | 0.1 | ---- | ---- | 1.7 | 0.2 |
| Idaho | 186.6 | 14.3 | 0.2 | 1.0 | 2.3 | 10.8 | ---- |
| Oregon | 656.4 | 75.0 | 0.9 | 1.7 | 3.2 | 66.2 | 3.0 |
| Washington | 839.6 | 52.5 | 2.0 | 3.9 | 1.2 | 41.2 | 4.2 |

[1] These estimates include approximately 1.9 million employees in approximately 120,000 establishments where working conditions may be subject to safety or health standards or regulations of other Federal agencies. Under section 4(b)(1) of the Williams-Steiger Occupational Safety and Health Act of 1970, the standards of the OSH Act do not apply to the extent other Federal agencies "exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health." OSHA standards, therefore, may not apply or may apply only over certain working conditions in establishments regulated by the Atomic Energy Commission and in the mining and transportation industries.

[2] Less than 50 employees.

# B. WORK-INJURY RATES BY INDUSTRY, 1958-70

TABLE B-1.—*Work-Injury Rates, by Industry, 1958-70* [1]

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Manufacturing | | 11.4 | 761 | 12.0 | 753 | 11.8 | 698 | 11.9 | 698 | 11.9 | 689 | 12.3 | 702 | 12.8 | 713 | 13.6 | 699 | 14.0 | 709 | 14.0 | 690 | 14.8 | 730 | 15.2 | 759 |
| Ordnance and accessories | 19 | 3.1 | 198 | 2.4 | 63 | 2.2 | 117 | 2.8 | 499 | 2.4 | 146 | 2.7 | 614 | 2.8 | 731 | 3.4 | 255 | 5.6 | 205 | 4.1 | 192 | 5.9 | 314 | 9.8 | 284 |
| Ammunition, except for small arms | 192 | 2.6 | ..... | 1.6 | ..... | 1.4 | 77 | 2.3 | 578 | 1.9 | ..... | 1.8 | ..... | 1.8 | ..... | 2.7 | 234 | 4.6 | 168 | 2.5 | 162 | ..... | ..... | 9.3 | 210 |
| Sighting and fire control equipment | 194 | 3.1 | ..... | 2.6 | ..... | 2.4 | ..... | 2.6 | ..... | 2.4 | ..... | 2.2 | 81 | 2.8 | ..... | ..... | ..... | 2.9 | ..... | 2.1 | ..... | 3.5 | ..... | ..... | ..... |
| Small arms | 195 | 6.9 | ..... | 10.0 | ..... | 6.1 | ..... | 8.9 | ..... | 7.3 | ..... | 8.9 | ..... | 9.2 | 234 | 10.6 | 290 | 9.8 | 509 | 13.3 | ..... | 13.0 | 348 | 12.4 | 456 |
| Small arms ammunition | 196 | .8 | ..... | 1.3 | ..... | 1.6 | ..... | 1.5 | ..... | 3.3 | ..... | 2.3 | ..... | 2.7 | 199 | 1.9 | ..... | 2.1 | ..... | 2.3 | ..... | 1.7 | ..... | 2.4 | ..... |
| Food and kindred products | 20 | 19.5 | 1,009 | 21.1 | 973 | 21.4 | 920 | 21.4 | 989 | 21.8 | 1,085 | 22.9 | 1,070 | 23.4 | 972 | 24.7 | 953 | 25.3 | 1,044 | 26.8 | 1,023 | 27.3 | 1,169 | 28.8 | 1,156 |
| Meat products | 201 | 25.2 | 1,015 | 29.3 | 1,038 | 28.7 | 712 | 28.6 | 873 | 30.8 | 918 | 34.3 | 1,079 | 37.0 | 978 | 36.2 | 848 | 38.1 | 988 | 38.5 | 970 | 40.4 | 1,017 | 43.1 | 1,262 |
| Meat packing plants | 2011 | 22.2 | 921 | 25.4 | 1,020 | 25.2 | 776 | 27.2 | 917 | 28.7 | 874 | 32.0 | 1,152 | 35.4 | 913 | 36.8 | 992 | 38.1 | 1,023 | 40.1 | 968 | 39.1 | 1,011 | 46.9 | 1,194 |
| Sausages and other prepared meats | 2013 | 21.1 | 493 | 24.8 | 1,218 | 23.4 | 444 | 23.6 | 658 | 25.5 | 993 | 25.8 | 584 | 26.9 | 661 | 25.7 | 415 | 28.9 | 831 | 34.7 | 941 | 35.8 | 760 | 38.2 | 864 |
| Poultry dressing and packing | 2015 | 39.9 | 1,761 | 47.8 | 962 | 45.1 | 698 | 36.5 | 902 | 41.0 | 991 | 46.9 | 1,202 | 48.7 | 1,397 | 42.0 | 788 | 44.4 | 1,012 | 37.6 | 996 | 45.9 | 1,191 | 38.9 | 1,631 |
| Dairy products | 202 | 19.7 | 826 | 22.0 | 819 | 22.5 | 1,086 | 21.9 | 1,208 | 21.7 | 1,254 | 22.1 | 1,042 | 21.1 | 1,008 | 23.1 | 1,031 | 23.1 | 1,030 | 24.0 | 945 | 24.2 | 1,356 | 25.1 | 1,208 |
| Creamery butter | 2021 | ..... | ..... | 24.3 | ..... | 22.8 | ..... | 33.0 | ..... | 30.0 | ..... | 26.2 | ..... | 24.7 | ..... | 24.2 | ..... | 16.2 | ..... | 29.9 | ..... | 27.7 | ..... | ..... | ..... |
| Cheese, natural and processed | 2022 | 17.5 | ..... | 24.9 | ..... | 22.2 | ..... | 23.0 | ..... | 24.4 | ..... | 25.3 | ..... | 20.8 | ..... | 22.7 | ..... | 20.5 | ..... | 21.0 | ..... | 23.3 | 1,057 | 24.8 | 1,158 |
| Condensed and evaporated milk | 2023 | 17.2 | ..... | 17.6 | ..... | 16.4 | ..... | 19.6 | ..... | 19.5 | ..... | 21.4 | ..... | 19.9 | ..... | 23.1 | ..... | 22.5 | ..... | 26.3 | ..... | 24.8 | ..... | 20.1 | ..... |
| Ice cream and frozen desserts | 2024 | 15.7 | 355 | 15.0 | ..... | 16.8 | ..... | 17.0 | ..... | 14.5 | ..... | 18.3 | ..... | 16.7 | ..... | 18.5 | ..... | 15.5 | ..... | 21.5 | ..... | 15.9 | ..... | 21.9 | ..... |
| Fluid milk | 2026 | 20.8 | 975 | 23.1 | 997 | 23.9 | 1,151 | 22.1 | 1,179 | 22.3 | 1,334 | 22.1 | 954 | 21.6 | 959 | 23.7 | 1,078 | 25.1 | 1,126 | 24.1 | 1,065 | 25.4 | 1,542 | 25.7 | 1,298 |
| Canned and preserved foods, except meats | 203 | 21.0 | 1,081 | 22.6 | 994 | 22.8 | 907 | 23.7 | 1,008 | 22.5 | 872 | 22.6 | 895 | 23.1 | 784 | 25.2 | 1,024 | 23.9 | 1,086 | 25.4 | 921 | 25.2 | 1,420 | 25.7 | 1,026 |
| Canned and cured sea foods | 2031 | 27.2 | ..... | 38.4 | 1,905 | 30.1 | ..... | 44.6 | 887 | 36.9 | ..... | 33.8 | ..... | 35.7 | 619 | 45.7 | ..... | 38.6 | 1,331 | 37.5 | 1,246 | 41.6 | ..... | 41.9 | ..... |
| Canned specialties | 2032 | 12.3 | 566 | 16.5 | 434 | 16.2 | 1,140 | 16.1 | 1,165 | 13.0 | 731 | 12.1 | 807 | 11.8 | 347 | 14.4 | 599 | 16.6 | 689 | 14.3 | 695 | 14.3 | ..... | 13.9 | 602 |
| Canned fruits, vegetables, and jellies | 2033 | 20.2 | 1,171 | 20.8 | 1,164 | 21.9 | 802 | 21.0 | 835 | 19.9 | 963 | 21.9 | 999 | 22.4 | 716 | 23.1 | 1,130 | 23.1 | 1,307 | 23.8 | 783 | 21.8 | 1,290 | 23.7 | 999 |
| Dried and dehyurated fruits and vegetables | 2034 | 18.4 | ..... | 19.6 | ..... | 17.3 | ..... | 17.1 | ..... | 17.8 | ..... | 18.1 | ..... | 24.4 | ..... | 17.6 | ..... | 23.0 | ..... | 23.4 | ..... | ..... | ..... | 28.4 | ..... |
| Pickled fruits, vegetables, sauces and dressings | 2035 | 21.6 | ..... | 20.2 | ..... | 20.9 | ..... | 21.6 | ..... | 22.1 | ..... | 26.3 | ..... | 24.3 | ..... | 28.3 | ..... | 23.2 | ..... | 24.7 | ..... | 26.0 | ..... | 27.6 | ..... |
| Fresh or frozen packaged fish | 2036 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 31.4 | ..... | 41.6 | ..... | 41.2 | ..... | 46.3 | 950 |
| Frozen fruits, juices, and vegetables | 2037 | 18.5 | 1,472 | 24.1 | 968 | 26.0 | 1,281 | 25.4 | 1,351 | 25.6 | 1,070 | 24.1 | 933 | 23.0 | 785 | 27.5 | 1,351 | 24.8 | 1,052 | 28.4 | 1,517 | 29.6 | 2,053 | 24.9 | 1,487 |
| Grain mill products | 204 | 16.2 | 1,339 | 14.1 | 1,125 | 15.3 | 942 | 16.0 | 1,367 | 17.3 | 1,160 | 18.3 | 1,528 | 18.1 | 1,275 | 17.9 | 1,412 | 22.6 | 1,688 | 21.2 | 1,557 | 23.0 | 1,316 | 21.8 | 1,241 |
| Flour and other grain mill products | 2041 | 17.3 | 1,771 | 15.3 | 2,271 | 16.6 | 849 | 18.6 | 868 | 17.7 | 1,247 | 18.2 | 1,944 | 20.8 | 2,093 | 22.7 | 1,890 | 23.0 | 1,316 | 23.2 | 1,796 | 26.6 | 1,267 | 26.0 | 1,629 |
| Prepared feeds for animals and fowls | 2042 | 20.1 | 1,662 | 16.9 | 644 | 18.1 | 1,406 | 18.8 | 2,336 | 21.0 | 1,254 | 22.7 | 2,036 | 21.3 | 1,735 | 18.9 | 1,683 | 25.6 | 2,298 | 25.0 | 1,968 | 25.5 | 1,326 | 25.0 | 1,392 |
| Cereal preparations | 2043 | 4.4 | ..... | 4.6 | ..... | 5.6 | ..... | 4.8 | ..... | 7.1 | ..... | 6.0 | ..... | 6.7 | ..... | 8.6 | ..... | 9.5 | 324 | 7.3 | ..... | 6.8 | ..... | 8.8 | 283 |
| Wet corn milling | 2046 | 7.3 | ..... | 6.8 | ..... | 8.0 | ..... | 7.8 | ..... | 8.1 | 1,616 | 10.3 | ..... | 10.6 | ..... | ..... | ..... | 10.6 | ..... | 11.6 | ..... | 12.0 | ..... | 10.5 | ..... |
| Bakery products | 205 | 16.0 | 850 | 16.8 | 754 | 17.4 | 788 | 16.3 | 793 | 16.4 | 795 | 17.0 | 881 | 16.7 | 637 | 18.5 | 668 | 18.7 | 871 | 21.3 | 917 | 21.1 | 764 | 22.6 | 793 |
| Bread and other perishable bakery products | 2051 | 16.4 | 859 | 17.4 | 754 | 18.2 | 804 | 16.9 | 860 | 17.2 | 848 | 17.8 | 953 | 17.1 | 638 | 19.2 | 643 | 18.9 | 885 | 22.5 | 938 | 22.2 | 803 | 23.3 | 824 |
| Biscuit, crackers, and pretzels | 2052 | 12.9 | 792 | 13.5 | 756 | 11.7 | 679 | 12.5 | 386 | 10.9 | 471 | 12.4 | 440 | 14.1 | 633 | 14.3 | 828 | 17.5 | 785 | 14.2 | 792 | 14.6 | 528 | 18.1 | 596 |
| Sugar | 206 | 23.4 | 1,031 | 21.3 | 1,109 | 19.5 | 1,119 | 21.0 | 1,494 | 20.7 | 1,146 | 21.2 | 1,856 | 19.1 | 1,272 | 18.0 | 2,053 | 21.3 | 1,629 | 23.3 | 1,275 | 24.5 | 1,657 | 25.4 | 1,991 |
| Cane sugar, except refining only | 2061 | ..... | ..... | 13.0 | ..... | 11.5 | ..... | 12.9 | ..... | 15.6 | 1,680 | 13.4 | ..... | 9.3 | ..... | ..... | ..... | ..... | ..... | 20.0 | ..... | ..... | ..... | 14.2 | ..... |
| Cane sugar, refining only | 2062 | 12.7 | 812 | 14.8 | 516 | 12.7 | 521 | 11.6 | ..... | 11.0 | ..... | 12.6 | ..... | 14.6 | 1,033 | 11.4 | ..... | 12.9 | ..... | 13.5 | ..... | 13.2 | ..... | 13.2 | ..... |
| Beet sugar | 2063 | 34.6 | 1,408 | 34.5 | 1,966 | 30.2 | 1,428 | 36.0 | 1,596 | 32.5 | 1,216 | 32.1 | 2,863 | 29.4 | 2,201 | 29.8 | ..... | 29.8 | 2,770 | 32.8 | 1,747 | 37.6 | 2,265 | 42.3 | ..... |
| Confectionery and related products | 207 | 13.9 | 801 | 14.2 | 664 | 14.5 | 483 | 14.2 | 487 | 14.4 | 760 | 15.9 | 594 | 16.7 | 696 | 21.9 | 602 | 22.5 | 732 | 22.3 | 361 | 22.2 | 817 | 21.4 | 679 |
| Candy and other confectionery products | 2071 | 14.9 | 746 | 15.0 | 736 | 15.9 | 485 | 15.2 | 491 | 14.9 | 859 | 17.3 | 654 | 18.2 | 799 | 24.0 | 680 | 24.7 | 771 | 23.8 | 758 | 24.4 | 870 | 23.4 | 635 |
| Chocolate and cocoa products | 2072 | 7.0 | ..... | 9.0 | ..... | 7.9 | ..... | 7.9 | ..... | 7.6 | ..... | 8.8 | ..... | 7.0 | ..... | 7.9 | ..... | 10.5 | ..... | 13.2 | ..... | 11.8 | ..... | 13.2 | ..... |
| Chewing gum | 2073 | 12.3 | ..... | 13.2 | ..... | 10.4 | ..... | 13.8 | ..... | ..... | ..... | 12.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12.5 | ..... |
| Beverages | 208 | 18.6 | 1,134 | 19.2 | 977 | 20.5 | 975 | 21.3 | 811 | 22.1 | 846 | 21.4 | 863 | 21.8 | 792 | 24.0 | 831 | 24.5 | 880 | 27.7 | 994 | 27.2 | 1,063 | 30.7 | 1,105 |
| Malt liquors | 2082 | 16.5 | 1,012 | 16.9 | 1,010 | 17.0 | 871 | 18.1 | 1,148 | 18.4 | 949 | 17.5 | 300 | 15.7 | 661 | 15.8 | 766 | 16.5 | 841 | 17.3 | 867 | 19.2 | 1,060 | 19.2 | 1,025 |
| Wines, brandy, and brandy spirits | 2084 | 19.1 | ..... | 13.6 | ..... | 15.7 | ..... | 19.1 | ..... | 13.2 | ..... | 16.8 | ..... | 17.3 | ..... | 17.0 | ..... | 16.9 | ..... | 17.8 | ..... | 22.2 | ..... | 29.8 | ..... |
| Distilled, rectified, and blended liquors | 2085 | 8.0 | ..... | 8.3 | ..... | 6.7 | ..... | 7.4 | ..... | 9.5 | ..... | 9.0 | ..... | 10.1 | ..... | 11.2 | 307 | 10.2 | ..... | 11.1 | ..... | 11.1 | ..... | 13.2 | ..... |
| Bottled and canned soft drinks | 2086 | 22.5 | 824 | 23.6 | 1,013 | 26.1 | 1,249 | 25.9 | 725 | 26.7 | 812 | 26.2 | 893 | 27.3 | 929 | 30.6 | 910 | 31.3 | 829 | 35.9 | 1,173 | 35.2 | 1,153 | 38.1 | 975 |
| Flavoring extracts and sirups | 2087 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

See footnotes at end of table,

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Food and kindred products—Continued | | | | | | | | | | | | | | | | | | | | | | | | | |
| Miscellaneous food and kindred products | 209 | 18.4 | 1,266 | 20.8 | 1,603 | 19.7 | 1,388 | 21.0 | 1,157 | 21.4 | 2,431 | 22.1 | 1,693 | 23.8 | 1,775 | 24.2 | 1,136 | 23.3 | 1,174 | 26.4 | 1,214 | 25.3 | 1,574 | 27.8 | 1,790 |
| Cottonseed oil mills | 2091 | 27.1 | | 21.1 | | 21.3 | | 24.6 | | 24.1 | | 19.8 | | 22.6 | | | | 26.0 | | 30.7 | | | | 35.7 | |
| Soybean oil mills | 2092 | 17.3 | | 19.6 | | 15.7 | | 17.9 | | 18.3 | | 18.0 | | 18.2 | | 18.0 | | | | 17.0 | | | | | |
| Animal, marine fats and oils (grease and tallow) | 2094 | 36.6 | | 54.0 | | 40.3 | | 46.5 | | | | | | | | | | | | | | | | | |
| Shortening, margarine, and edible oils, n.e.c | 2096 | 12.1 | | 10.4 | | 11.6 | | 10.3 | | 11.0 | | 10.7 | | 11.7 | | 11.1 | | 10.7 | | 10.9 | | 11.4 | | 16.3 | |
| Macaroni, spaghetti, vermicelli, and noodles | 2098 | 19.0 | | 16.2 | | 20.1 | | 19.4 | | 22.3 | | 23.0 | | 26.3 | | | | 35.7 | | 32.0 | | 31.1 | | 39.5 | |
| Food preparations, n.e.c | 2099 | 12.7 | 724 | 14.8 | 791 | 15.1 | 516 | 15.0 | 788 | 15.8 | 745 | 20.2 | 1,337 | 19.2 | 621 | 16.5 | 627 | 19.6 | 726 | 23.2 | 595 | 23.8 | 542 | 21.2 | 1,068 |
| Tobacco manufactures | 21 | 7.8 | 249 | 8.7 | 396 | 8.4 | 569 | 9.3 | 349 | 7.5 | | 7.5 | | 9.5 | 485 | 10.2 | 333 | 9.7 | 428 | 10.3 | 420 | 8.8 | 192 | 11.9 | 332 |
| Cigarettes | 211 | 4.6 | | 4.8 | | 4.4 | | 4.1 | | 4.0 | | 4.5 | | 6.3 | | 6.3 | | 5.9 | | 7.2 | | 6.0 | | 8.3 | |
| Cigars | 212 | 7.1 | | 8.0 | | 6.3 | | 6.6 | | 5.4 | | 5.8 | | 7.0 | | 8.5 | | 7.0 | | 8.5 | | 7.4 | | | |
| Tobacco (chewing and smoking) and snuff | 213 | | | | | | | | | | | | | | | 12.3 | | | | | | | | | |
| Textile mill products | 22 | 9.0 | 550 | 9.2 | 531 | 9.0 | 494 | 9.3 | 520 | 9.2 | 528 | 9.1 | 482 | 9.6 | 455 | 10.6 | 498 | 9.8 | 505 | 10.4 | 488 | 10.7 | 519 | 10.4 | 579 |
| Cotton broad woven fabrics | 221 | 7.1 | 504 | 6.3 | 410 | 6.0 | 331 | 5.7 | 441 | 5.9 | 359 | 5.9 | 509 | 6.5 | 300 | 6.8 | 398 | 6.0 | 499 | 5.4 | 444 | 6.0 | 567 | 6.3 | 423 |
| Silk and synthetic broad woven fabrics | 222 | 7.0 | 231 | 7.5 | 436 | 6.5 | 491 | 7.9 | 760 | 7.6 | 305 | 7.2 | 386 | 7.5 | 226 | 8.7 | 543 | 9.2 | 393 | 8.1 | 363 | 9.7 | 403 | 8.3 | 696 |
| Weaving, dyeing, and finishing broad woolens | 223 | 14.5 | 695 | 14.0 | 493 | 14.4 | 900 | 14.5 | 897 | 14.8 | 1,005 | 15.9 | 768 | 16.4 | 755 | 16.8 | 602 | 17.1 | 759 | 19.3 | 793 | 19.0 | 884 | 14.3 | 1,047 |
| Narrow fabrics and smallwares | 224 | 9.3 | | 10.7 | | 10.7 | | 10.4 | | 11.9 | 1,473 | 11.5 | | 12.1 | 414 | 12.5 | 366 | 13.0 | 512 | 11.5 | 334 | 10.6 | | 10.0 | |
| Knitting mills | 225 | 5.7 | 170 | 6.3 | 234 | 6.4 | 184 | 7.1 | 183 | 6.9 | 221 | 7.6 | 183 | 7.7 | 267 | 9.0 | 249 | 8.3 | 330 | 9.5 | 215 | 8.1 | 181 | 9.4 | 319 |
| Women's full and knee length hosiery | 2251 | 3.6 | | 3.4 | | 3.9 | | 4.8 | | 4.2 | | 4.1 | | 4.5 | | 4.6 | | 4.8 | | 5.8 | 125 | 5.7 | | 5.5 | |
| Hosiery, except women's full & knee length | 2252 | 4.1 | | 5.0 | | 4.6 | | 5.2 | | 4.3 | | 7.2 | | 6.0 | | 7.3 | | 7.9 | | 8.4 | | 8.0 | | 7.6 | |
| Knit outerwear mills | 2253 | 6.5 | | 6.5 | | 7.0 | | 8.0 | | 8.3 | | 8.8 | 160 | 7.5 | | 8.6 | 163 | 7.3 | | 8.2 | 165 | 7.0 | | 8.3 | |
| Knit underwear mills | 2254 | 5.9 | | 6.5 | | 6.8 | | 6.9 | | 7.3 | | 6.6 | | 6.8 | | 8.7 | | 9.1 | | 10.2 | | 9.1 | | 9.9 | |
| Knit fabric mills | 2256 | 13.6 | | 16.1 | | 15.1 | | 15.7 | | 13.3 | | 13.0 | | 18.6 | | 21.6 | | 17.4 | | 21.0 | | | | 18.9 | |
| Knitting mills, n.e.c | 2259 | 8.6 | | 7.9 | 260 | 7.9 | 135 | 5.2 | 264 | 8.5 | 268 | 11.3 | 153 | 6.0 | | | | | | 8.0 | | 6.5 | | 12.2 | |
| Dyeing and finishing textiles, except wool and knit | 226 | 15.2 | 921 | 14.3 | 616 | 15.5 | 749 | 15.8 | 885 | 13.9 | 939 | 13.3 | 762 | 12.8 | 668 | 25.1 | 647 | 15.8 | 637 | 15.2 | 602 | 19.4 | 639 | 14.8 | 639 |
| Finishers of broad woven cotton | 2261 | 12.5 | 875 | 10.8 | 526 | 12.9 | 662 | 11.4 | 573 | 10.6 | 839 | 9.1 | 669 | 10.2 | 626 | 12.7 | 652 | 11.1 | 587 | 10.4 | 474 | 12.2 | 680 | 13.1 | 716 |
| Finishers of broad woven silk and synthetics | 2262 | 25.4 | | 26.3 | | 25.7 | | 27.9 | | 22.1 | | 23.3 | | 18.8 | | 20.6 | | 25.0 | | 24.7 | | 29.6 | | 18.9 | |
| Dyeing and finishing textiles, n.e.c | 2269 | 11.6 | 620 | 11.2 | 548 | 9.9 | | 10.7 | | 12.2 | | 13.4 | | 14.0 | | 18.6 | | 17.3 | | 17.5 | | 19.6 | | 13.4 | |
| Floor covering mills | 227 | 9.9 | | 9.5 | 535 | 9.2 | | 9.7 | | 8.8 | | 8.0 | | 9.6 | | 11.0 | 830 | 7.0 | 302 | 11.5 | 594 | 11.8 | 600 | 13.3 | 876 |
| Woven carpets and rugs | 2271 | 9.0 | 655 | 9.6 | 797 | 8.3 | | 8.5 | | 9.2 | | 6.5 | | 8.5 | | 6.8 | | 5.9 | | 10.1 | | 12.2 | | 12.0 | |
| Tufted carpets and rugs | 2272 | | | 9.9 | | 11.6 | | 10.8 | | 8.1 | | 9.9 | | 9.7 | | | | | | 12.1 | 804 | 11.4 | 695 | 14.4 | 1,011 |
| Yarn and thread mills | 228 | 11.5 | 787 | 11.9 | 825 | 11.4 | 707 | 11.4 | 491 | 11.0 | 435 | 10.2 | 472 | 9.9 | 519 | 11.4 | 523 | 8.6 | 571 | 10.4 | 793 | 10.1 | 623 | 11.2 | 630 |
| Yarn spinning mills, cotton, synthetics and silk | 2281 | 9.7 | 676 | 11.3 | 953 | 11.4 | 904 | 11.3 | 557 | 9.5 | 447 | 9.3 | 503 | 8.4 | 572 | 10.3 | 550 | 8.0 | 675 | 9.3 | 986 | 8.4 | 769 | 9.2 | 523 |
| Yarn winding mills, cotton, synthetics and silk | 2282 | 6.7 | | 8.8 | | 7.2 | | 9.4 | | 11.5 | | 8.5 | | 5.5 | 160 | 6.8 | | 5.7 | | 6.8 | 189 | 9.2 | | 15.2 | 505 |
| Yarn mills, wool, including carpet and rug yarn | 2283 | 22.8 | 1,846 | 17.5 | 913 | 16.6 | | 15.0 | 616 | 15.3 | 606 | 14.3 | 696 | 17.3 | | 17.8 | | 11.0 | | 16.3 | | 14.3 | 533 | 14.2 | |
| Thread mills | 2284 | 9.3 | | 8.6 | | 7.5 | | 9.3 | | 13.4 | | 12.1 | | 13.0 | | 13.9 | | 12.8 | | 11.8 | | 18.1 | | 12.2 | |
| Miscellaneous textile goods | 229 | 12.7 | 1,461 | 15.7 | 1,501 | 15.3 | 1,185 | 15.2 | 712 | 16.8 | 1,157 | 15.4 | 895 | 18.5 | 990 | 18.3 | 1,085 | 18.6 | 893 | 19.2 | 812 | 18.6 | 1,026 | 17.7 | 1,180 |
| Felt goods, except woven felts and hats | 2291 | 18.2 | | 20.1 | | 17.1 | | 20.5 | | 21.6 | | 21.8 | | 25.8 | | 23.9 | | 21.6 | 1,890 | 35.2 | | 27.2 | | 32.3 | |
| Lace goods | 2292 | 8.0 | | 11.7 | | 11.5 | | 11.6 | | 12.6 | | 13.1 | | 13.6 | | 15.2 | | 12.9 | | 16.6 | | 18.1 | | | |
| Paddings and upholstery filling | 2293 | | | 19.3 | | | | 19.6 | | | | 23.0 | | | | | | | | | | | | | |
| Processed waste and recovered fibers and flock | 2294 | | | 32.7 | | | | 30.2 | | 30.5 | | 29.4 | | 29.9 | | | | 24.7 | | | | | | | |
| Artificial leather, coated fabric not rubberized | 2295 | 14.9 | | 10.9 | | 15.6 | | 13.2 | | 16.4 | | 16.8 | | 15.1 | | 18.3 | | 22.4 | | 21.7 | | 15.4 | | 18.3 | |
| Tire cord and fabric | 2296 | 3.6 | | 3.5 | | 3.1 | | 4.1 | | 3.0 | | 2.8 | | 2.0 | | 2.7 | | 2.8 | | 2.5 | | 3.8 | | 4.6 | |
| Wool scouring and worsted combing | 2297 | | | 25.9 | | | | 22.7 | | 17.0 | | 16.5 | | 24.4 | | | | | | 17.3 | | | | | |
| Cordage and twine | 2298 | 11.2 | | 13.9 | | 13.7 | | 18.2 | | 21.4 | | 17.0 | | 19.7 | | 20.8 | | 21.3 | | 20.9 | | 21.4 | | 21.8 | |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Apparel and related products | 23 | 6.0 | 231 | 6.7 | 148 | 6.1 | 123 | 6.5 | 182 | 6.4 | 169 | 6.6 | 147 | 6.8 | 154 | 7.2 | 179 | 6.9 | 144 | 7.2 | 181 | 7.7 | 142 | 7.7 | 207 |
| Men's and boys' suits and coats | 231 | 6.1 | 180 | 7.0 | 145 | 6.2 | 140 | 7.0 | 163 | 6.6 | 210 | 6.8 | 145 | 7.9 | 112 | 7.3 | 145 | 8.4 | 159 | 8.4 | 161 | 9.5 | 150 | 8.7 | 185 |
| Men's and boys' furnishings | 232 | 5.5 | 166 | 6.3 | 132 | 5.9 | 112 | 6.3 | 177 | 6.5 | 172 | 7.1 | 148 | 7.5 | 102 | 7.7 | 166 | 7.7 | 130 | 8.4 | 213 | 8.7 | 162 | 10.0 | 285 |
| Men's and boys' dress shirts and nightwear | 2321 | 4.4 | ..... | 5.5 | 131 | 4.8 | ..... | 5.5 | 153 | 5.4 | 279 | 6.3 | 120 | 5.8 | 104 | 6.2 | 204 | 5.8 | ..... | 6.3 | 124 | 6.0 | 103 | 7.3 | 172 |
| Men's and boys' underwear | 2322 | 3.5 | ..... | 4.3 | ..... | 3.1 | ..... | 4.8 | ..... | 5.5 | ..... | 5.2 | ..... | 3.1 | ..... | ..... | ..... | 4.1 | ..... | 6.7 | ..... | 6.7 | ..... | 6.1 | ..... |
| Men's and boys' neckwear | 2323 | ..... | ..... | 5.4 | ..... | ..... | ..... | 4.0 | ..... | ..... | ..... | 4.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Men's and boys' separate trousers | 2327 | 4.1 | ..... | 6.3 | ..... | 7.1 | ..... | 6.1 | ..... | 5.9 | ..... | 7.4 | ..... | 8.6 | ..... | 8.5 | ..... | 8.9 | ..... | 8.8 | ..... | 9.3 | ..... | 13.2 | 379 |
| Work clothing | 2328 | 7.9 | ..... | 7.9 | ..... | 5.7 | ..... | 8.5 | ..... | 9.7 | ..... | 10.2 | ..... | 11.4 | 114 | 10.7 | 195 | 10.6 | 191 | 12.0 | 146 | 13.2 | 325 | 12.5 | 267 |
| Men's and boys' clothing, n.e.c | 2329 | 5.9 | ..... | 7.1 | ..... | 8.4 | ..... | 6.3 | ..... | 6.1 | ..... | 5.1 | ..... | 6.3 | ..... | 6.9 | ..... | 7.7 | ..... | 8.5 | ..... | 7.4 | ..... | 9.3 | ..... |
| Women's, misses', and juniors' outerwear | 233 | 4.3 | 75 | 5.0 | 89 | 4.5 | 76 | 4.6 | 107 | 4.5 | 103 | 4.4 | 75 | 4.2 | 110 | 5.1 | 104 | 4.5 | 97 | 4.6 | 96 | 4.7 | 86 | 4.4 | 104 |
| Blouses, waists, and shirts | 2331 | 2.7 | ..... | 2.3 | ..... | 2.9 | ..... | 2.9 | ..... | 2.2 | ..... | 2.5 | ..... | 2.7 | ..... | 2.2 | ..... | 2.4 | ..... | 3.0 | ..... | 3.2 | ..... | 2.7 | ..... |
| Dresses | 2335 | 3.9 | ..... | 5.1 | 92 | 4.0 | ..... | 3.9 | ..... | 4.5 | 93 | 3.9 | ..... | 3.8 | ..... | 4.3 | ..... | 4.5 | 98 | 4.1 | 104 | 4.0 | ..... | 4.1 | ..... |
| Suits, shirts, coats, except fur and raincoats | 2337 | 5.6 | ..... | 6.4 | ..... | 6.1 | ..... | 6.5 | ..... | 5.2 | ..... | 5.5 | ..... | 5.1 | ..... | 6.7 | ..... | 4.4 | ..... | 4.7 | ..... | 5.7 | ..... | 4.7 | ..... |
| Women's, misses', and juniors' outerwear, n.e.c | 2339 | 4.9 | ..... | 4.4 | ..... | 5.2 | ..... | 5.4 | ..... | 5.1 | ..... | 5.9 | ..... | 5.3 | ..... | 7.2 | ..... | 6.1 | ..... | 6.7 | ..... | 6.4 | ..... | 5.6 | ..... |
| Women's and children's undergarments | 234 | 6.4 | 786 | 5.6 | 100 | 5.0 | ..... | 5.6 | 86 | 5.5 | 180 | 5.3 | ..... | 5.5 | 133 | 5.0 | 97 | 4.3 | ..... | 5.8 | 236 | 5.1 | 129 | 5.8 | 316 |
| Women's and children's underwear and nightwear | 2341 | 6.3 | ..... | 5.3 | ..... | 4.8 | ..... | 5.6 | ..... | 5.1 | ..... | 5.0 | ..... | 4.8 | ..... | 4.2 | ..... | 3.8 | ..... | 5.2 | ..... | 4.8 | ..... | 5.9 | ..... |
| Corsets and allied garments | 2342 | 6.6 | ..... | 6.3 | ..... | 5.6 | ..... | 5.5 | ..... | 6.2 | ..... | 5.9 | ..... | 7.0 | ..... | 6.5 | ..... | 5.4 | ..... | 7.0 | ..... | 5.9 | ..... | 5.7 | ..... |
| Hats, caps, and millinery | 235 | 8.8 | 265 | 9.8 | ..... | 8.9 | ..... | 8.7 | ..... | 10.0 | ..... | 9.0 | ..... | 8.5 | ..... | 10.5 | ..... | 10.5 | ..... | 10.3 | ..... | 8.3 | ..... | 12.7 | ..... |
| Hats and caps, except millinery | 2352 | 10.3 | ..... | 14.4 | ..... | 13.1 | ..... | 13.0 | ..... | 15.7 | ..... | 12.7 | ..... | 14.0 | ..... | 12.9 | ..... | 14.2 | ..... | 17.1 | ..... | 13.2 | ..... | 21.1 | ..... |
| Girls' and children's outerwear | 236 | 6.3 | ..... | 6.7 | ..... | 6.6 | ..... | 6.8 | ..... | 5.9 | ..... | 5.2 | ..... | 5.9 | ..... | 6.3 | 148 | 6.0 | 117 | 6.2 | 145 | 7.2 | 106 | 6.2 | ..... |
| Dresses, blouses, waists, and shirts | 2361 | 5.3 | ..... | 6.9 | ..... | 5.7 | ..... | 6.3 | ..... | 6.8 | ..... | 5.1 | ..... | 5.2 | ..... | 6.2 | ..... | 3.9 | ..... | 4.9 | ..... | 6.5 | ..... | 6.3 | ..... |
| Coats and suits | 2363 | 10.6 | ..... | 10.7 | ..... | 12.4 | ..... | 10.9 | ..... | 8.5 | ..... | 7.2 | ..... | 8.8 | ..... | 7.3 | ..... | 5.1 | ..... | 5.0 | ..... | 5.3 | ..... | ..... | ..... |
| Girls' and children's outerwear, n.e.c | 2369 | 5.8 | ..... | 5.1 | ..... | 5.4 | ..... | 6.1 | ..... | 3.9 | ..... | 4.6 | ..... | 5.7 | ..... | 6.1 | ..... | 8.3 | ..... | 7.7 | ..... | 8.4 | ..... | 5.5 | ..... |
| Miscellaneous apparel and accessories | 238 | 7.5 | ..... | 9.5 | ..... | 8.8 | ..... | 7.6 | ..... | 7.4 | ..... | 8.1 | ..... | 9.6 | ..... | 8.9 | 198 | 8.6 | 196 | 9.0 | 232 | 8.4 | 106 | 9.2 | 137 |
| Dress and work gloves, except knit and leather | 2381 | 7.1 | ..... | 7.8 | ..... | 7.3 | ..... | 6.7 | ..... | 7.4 | ..... | 8.4 | ..... | 9.6 | ..... | 8.5 | ..... | 9.4 | ..... | 7.9 | ..... | 8.9 | ..... | 6.3 | ..... |
| Robes and dressing gowns | 2384 | ..... | ..... | 6.6 | ..... | 7.3 | ..... | 4.6 | ..... | 6.8 | ..... | 4.4 | ..... | 6.5 | ..... | ..... | ..... | ..... | ..... | 9.8 | ..... | 7.9 | ..... | 5.9 | ..... |
| Raincoats and other waterproof outer garments | 2385 | 10.0 | ..... | 13.4 | ..... | 11.2 | ..... | 9.9 | ..... | 10.3 | ..... | ..... | ..... | 12.5 | ..... | 8.8 | ..... | 11.4 | ..... | 13.8 | ..... | 12.1 | ..... | ..... | ..... |
| Apparel belts | 2387 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8.0 | ..... | ..... | ..... | ..... | ..... | 12.3 | ..... |
| Apparel, n.e.c | 2389 | 6.2 | ..... | 6.4 | ..... | 7.3 | ..... | 5.5 | ..... | 5.1 | ..... | 6.5 | ..... | 8.1 | ..... | ..... | ..... | 8.9 | ..... | 5.4 | ..... | 5.8 | ..... | 11.3 | ..... |
| Miscellaneous fabricated textile products | 239 | 9.4 | 372 | 10.3 | 275 | 9.5 | 205 | 10.5 | 388 | 9.8 | 307 | 11.3 | 360 | 10.7 | 367 | 11.2 | 445 | 11.1 | 257 | 9.8 | 266 | 12.8 | 269 | 10.8 | 285 |
| Housefurnishings, except curtains and draperies | 2392 | 11.4 | ..... | 14.1 | ..... | 13.4 | ..... | 16.8 | ..... | 13.8 | ..... | 13.2 | ..... | 15.8 | ..... | ..... | ..... | 15.0 | ..... | 13.2 | ..... | 13.9 | ..... | 12.6 | ..... |
| Textile bags | 2393 | 13.9 | ..... | 10.5 | ..... | 10.1 | ..... | 11.0 | ..... | 9.1 | ..... | 11.0 | ..... | 13.8 | ..... | 11.5 | ..... | 14.3 | ..... | 12.1 | ..... | 12.2 | ..... | 17.4 | ..... |
| Canvas products | 2394 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 14.4 | ..... | 20.3 | ..... | ..... | ..... | 23.1 | ..... |
| Pleating, decorative stitching, and tucking | 2395 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7.7 | ..... | ..... | ..... | 3.8 | ..... | ..... | ..... | ..... | ..... |
| Apparel findings and related products | 2396 | 7.5 | ..... | 3.4 | ..... | 5.2 | ..... | 3.4 | ..... | 4.5 | ..... | 5.1 | ..... | 4.3 | ..... | 6.2 | ..... | 5.9 | ..... | ..... | ..... | 5.1 | ..... | 6.6 | ..... |
| Fabricated textile products, n.e.c | 2399 | 6.6 | ..... | 8.5 | ..... | 7.0 | ..... | 9.0 | ..... | 9.5 | ..... | 9.8 | ..... | 10.4 | ..... | 12.9 | ..... | 12.1 | ..... | 9.2 | ..... | 11.4 | ..... | 11.2 | ..... |
| Lumber and wood products, except furniture | 24 | 37.0 | 3,050 | 38.0 | 3,051 | 35.7 | 2,674 | 36.0 | 2,441 | 36.7 | 2,943 | 36.0 | 3,355 | 36.0 | 3,131 | 36.1 | 3,078 | 39.2 | 3,127 | 36.1 | 2,973 | 34.6 | 2,595 | 34.1 | 2,891 |
| Logging camps and logging contractors | 241 | 62.6 | 6,927 | 58.8 | 6,381 | 59.5 | 5,913 | 56.1 | 5,529 | 58.6 | 7,275 | 53.9 | 6,859 | 52.6 | 7,253 | 48.4 | 7,277 | 58.3 | 6,692 | 43.2 | 6,247 | 38.4 | 4,843 | 42.4 | 6,157 |
| Sawmills and planing mills | 242 | 39.4 | 2,927 | 40.8 | 3,517 | 36.8 | 2,800 | 38.0 | 2,357 | 38.0 | 3,023 | 36.8 | 3,811 | 36.2 | 3,273 | 36.9 | 3,102 | 42.1 | 3,762 | 37.9 | 3,211 | 35.7 | 2,928 | 35.5 | 3,478 |
| Sawmills and planing mills, general | 2421 | 40.4 | 2,927 | 41.8 | 3,696 | 37.5 | 2,838 | 38.7 | 2,357 | 39.3 | 3,230 | 37.1 | 3,963 | 37.0 | 3,521 | 36.6 | 3,282 | 43.4 | 3,831 | 37.9 | 3,348 | 33.8 | 2,927 | 35.1 | 3,663 |
| Hardwood dimension and flooring mills | 2426 | 30.3 | 2,217 | 32.9 | 1,685 | 31.2 | 2,424 | 33.5 | ..... | 27.7 | ..... | 34.5 | 2,986 | 31.9 | ..... | 40.1 | 2,264 | 34.7 | 2,910 | 37.7 | 2,128 | 45.1 | 2,888 | 36.7 | 2,678 |
| Millwork, plywood, and related products | 243 | 23.1 | 1,713 | 24.0 | 1,237 | 22.8 | 1,095 | 25.8 | 1,334 | 26.1 | 1,350 | 25.9 | 1,563 | 28.0 | 1,503 | 27.7 | 1,471 | 29.2 | 1,639 | 30.6 | 1,709 | 30.7 | 1,623 | 29.5 | 1,398 |
| Millwork plants | 2431 | 20.8 | 1,299 | 21.2 | 1,011 | 22.2 | 1,022 | 24.5 | 1,111 | 26.8 | 1,022 | 26.4 | 1,699 | 26.9 | 1,220 | 27.4 | 1,583 | 29.4 | 1,070 | 32.1 | 1,358 | 28.5 | 1,178 | 28.4 | 965 |
| Veneer and plywood plants | 2432 | 24.6 | 2,118 | 24.3 | 1,510 | 23.6 | 1,159 | 25.3 | 1,568 | 26.2 | 1,868 | 24.6 | 1,561 | 28.6 | 1,595 | 28.0 | 1,294 | 29.1 | 2,192 | 28.0 | 2,131 | 30.7 | 2,087 | 27.2 | 1,726 |
| Prefabricated wooden buildings and members | 2433 | 27.6 | ..... | 37.0 | ..... | 21.9 | ..... | 34.5 | ..... | 22.5 | ..... | 29.1 | ..... | 30.1 | ..... | 27.3 | ..... | ..... | ..... | 35.1 | ..... | 38.7 | 1,513 | 41.1 | 1,689 |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Lumber and wood products, except furniture—Continued | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wooden containers | 244 | 28.4 | 1,155 | 31.1 | 974 | 31.0 | 1,766 | 32.4 | 2,009 | 33.9 | 1,471 | 35.0 | 1,997 | 34.4 | 971 | 37.6 | 2,026 | 31.5 | 1,681 | 36.3 | 1,701 | 31.9 | 1,212 | 32.4 | 2,608 |
| Nailed and lock corner wooden boxes and shook | 2441 | 28.0 | 1,364 | 33.6 | 1,131 | 36.2 | 2,128 | 36.0 | 2,290 | 36.2 | 1,157 | 38.9 | 1,942 | 38.9 | 780 | 41.4 | 1,727 | 29.8 | ..... | 41.2 | 1,921 | 35.4 | ..... | 31.8 | ..... |
| Wirebound boxes and crates | 2442 | 26.7 | ..... | 24.6 | ..... | 23.3 | ..... | 25.8 | ..... | 29.7 | ..... | 27.6 | ..... | 28.3 | ..... | 35.1 | ..... | 32.5 | ..... | 34.3 | ..... | 28.2 | ..... | ..... | ..... |
| Cooperage | 2445 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 31.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Miscellaneous wood products | 249 | 27.5 | 2,799 | 31.1 | 1,719 | 28.9 | 1,605 | 28.9 | 1,705 | 31.3 | 1,971 | 34.3 | 2,126 | 34.4 | 2,421 | 35.3 | 1,634 | 35.9 | 1,469 | 35.2 | 2,246 | 37.1 | 2,062 | 33.4 | 1,610 |
| Wood preserving | 2491 | 33.6 | ..... | 33.6 | ..... | 31.4 | ..... | 30.0 | ..... | 34.6 | ..... | 36.5 | ..... | 35.1 | ..... | 40.3 | ..... | 40.0 | ..... | 38.9 | ..... | 31.5 | ..... | 32.0 | ..... |
| Wood products, n.e.c. | 2499 | 26.1 | 2,187 | 30.5 | 1,545 | 28.3 | 1,076 | 28.7 | 1,383 | 30.5 | 1,437 | 33.7 | 1,795 | 34.2 | 1,485 | 34.3 | 1,623 | 35.1 | 1,499 | 34.4 | 1,563 | 38.1 | 1,626 | 33.7 | 1,344 |
| Furniture and fixture | 25 | 16.1 | 1,000 | 18.8 | 825 | 17.6 | 741 | 19.4 | 881 | 17.8 | 775 | 18.6 | 765 | 19.9 | 842 | 20.8 | 928 | 22.5 | 943 | 22.3 | 945 | 23.2 | 1,076 | 22.0 | 909 |
| Household furniture | 251 | 16.4 | 1,010 | 18.6 | 884 | 18.0 | 783 | 19.5 | 912 | 18.4 | 807 | 19.1 | 792 | 18.9 | 822 | 19.4 | 946 | 22.9 | 1,014 | 22.0 | 954 | 23.2 | 1,151 | 22.0 | 960 |
| Wood household furniture, except upholstered | 2511 | 17.5 | 1,038 | 19.2 | 956 | 18.8 | 997 | 19.2 | 1,065 | 18.7 | 1,063 | 19.1 | 1,031 | 20.0 | 990 | 20.5 | 1,008 | 23.2 | 1,193 | 21.2 | 999 | 22.6 | 1,206 | 18.7 | 897 |
| Wood household furniture, upholstered | 2512 | 17.0 | 797 | 17.4 | 555 | 16.3 | 410 | 17.5 | 706 | 16.5 | 408 | 18.6 | 541 | 17.3 | 689 | 18.6 | 1,101 | 22.0 | 891 | 22.2 | 770 | 21.4 | 818 | 21.8 | 834 |
| Metal household furniture | 2514 | 14.6 | 1,809 | 19.5 | 1,185 | 16.3 | ..... | 23.2 | 873 | 17.2 | ..... | 20.0 | ..... | 17.7 | ..... | 17.0 | ..... | ..... | ..... | 28.5 | 1,322 | 29.3 | ..... | 37.6 | 1,313 |
| Mattresses and bedsprings | 2515 | 13.3 | ..... | 18.3 | 980 | 18.9 | 929 | 21.9 | 678 | 21.4 | 690 | 19.6 | 548 | 17.9 | 516 | 17.5 | ..... | 17.5 | 683 | 19.6 | 851 | 24.3 | 1,405 | 22.7 | 1,218 |
| Office furniture | 252 | 14.4 | 507 | 16.6 | 539 | 14.5 | 644 | 18.4 | 858 | 18.0 | 837 | 17.2 | 635 | 20.4 | 742 | 21.8 | 1,137 | 20.4 | 605 | 20.8 | 672 | 24.4 | 972 | 23.5 | 886 |
| Wood office furniture | 2521 | 13.7 | ..... | 17.9 | ..... | 14.2 | ..... | 21.3 | ..... | 18.0 | ..... | 18.7 | ..... | 21.2 | ..... | 23.4 | ..... | 19.8 | ..... | 25.0 | ..... | 30.4 | ..... | 20.3 | ..... |
| Metal office furniture | 2522 | 14.6 | 440 | 16.2 | 432 | 14.6 | 620 | 17.4 | 960 | 18.0 | 954 | 16.6 | 641 | 20.1 | 728 | 21.3 | 1,015 | 20.6 | 576 | 19.3 | 641 | 22.3 | 991 | 18.2 | 743 |
| Public building and related furniture | 253 | 15.5 | ..... | 20.4 | 1,087 | 18.2 | ..... | 17.0 | ..... | 16.6 | ..... | 17.2 | ..... | 22.3 | ..... | 28.3 | 702 | 19.6 | ..... | 22.2 | 1,271 | 22.0 | ..... | 23.9 | ..... |
| Partitions, office and store fixtures | 254 | 16.9 | 1,234 | 21.3 | 454 | 19.9 | 679 | 20.8 | 954 | 16.2 | 794 | 19.8 | 427 | 25.1 | 714 | 25.9 | 913 | 26.3 | 848 | 25.9 | 949 | 25.6 | 1,079 | 24.7 | 779 |
| Wood partitions and office and store fixtures | 2541 | 16.7 | ..... | 21.9 | ..... | 19.9 | ..... | 21.3 | ..... | 15.1 | ..... | 19.4 | ..... | 25.6 | ..... | 23.3 | ..... | 25.6 | ..... | 24.7 | ..... | 24.0 | ..... | 22.4 | ..... |
| Metal partitions and office and store fixtures | 2542 | 17.1 | ..... | 20.7 | ..... | 19.8 | ..... | 20.2 | ..... | 17.8 | ..... | 20.4 | ..... | 24.3 | 983 | 20.1 | 1,129 | 27.2 | 974 | 27.3 | 954 | 27.7 | 1,053 | 27.6 | 1,037 |
| Miscellaneous furniture and fixtures | 259 | 13.3 | ..... | 17.6 | ..... | 12.7 | ..... | 17.8 | ..... | 14.0 | ..... | 13.4 | ..... | 20.6 | ..... | 20.7 | ..... | 16.3 | ..... | 21.6 | ..... | 16.8 | ..... | 16.4 | ..... |
| Venetian blinds and shades | 2591 | 12.3 | ..... | 16.9 | ..... | 10.5 | ..... | 13.4 | ..... | 10.8 | ..... | 10.6 | ..... | 15.2 | ..... | 10.8 | ..... | 10.6 | ..... | 14.5 | ..... | 13.0 | ..... | 12.1 | ..... |
| Paper and allied products | 26 | 11.4 | 993 | 12.3 | 761 | 12.4 | 901 | 12.3 | 898 | 12.4 | 755 | 12.5 | 861 | 12.6 | 916 | 13.3 | 907 | 14.0 | 807 | 14.2 | 797 | 16.2 | 937 | 13.9 | 937 |
| Pulp mills | 261 | 9.1 | ..... | 10.9 | ..... | 8.1 | ..... | 7.2 | ..... | 8.0 | ..... | 6.5 | ..... | 6.7 | ..... | 8.4 | ..... | 8.2 | ..... | 7.6 | ..... | 8.8 | ..... | 8.2 | ..... |
| Paper mills, except building paper | 262 | 9.1 | 1,170 | 9.1 | 904 | 10.1 | 906 | 9.7 | 918 | 9.4 | 645 | 9.4 | 749 | 8.3 | 790 | 9.1 | 873 | 9.2 | 824 | 9.2 | 697 | 9.0 | 913 | 7.8 | 727 |
| Paperboard mills | 263 | 10.3 | 1,187 | 12.2 | 646 | 12.4 | 1,052 | 11.3 | 1,651 | 12.8 | 1,202 | 12.3 | 2,021 | 11.8 | 1,989 | 13.2 | 1,149 | 14.0 | 1,178 | 15.5 | 977 | 16.9 | 1,411 | 15.7 | 1,145 |
| Converted paper and paperboard products | 264 | 15.0 | 665 | 14.3 | 586 | 14.1 | 875 | 13.1 | 619 | 12.8 | 648 | 14.2 | 604 | 14.7 | 813 | 17.3 | 783 | 16.5 | 584 | 17.5 | 725 | 21.5 | 773 | 17.7 | 911 |
| Paper coating and glazing | 2641 | 10.3 | ..... | 11.5 | ..... | 13.6 | 838 | 12.8 | 395 | 12.3 | 275 | 10.2 | 771 | 10.9 | 1,079 | ..... | ..... | ..... | ..... | 20.4 | 719 | 23.0 | 735 | 17.7 | ..... |
| Envelopes | 2642 | 13.4 | ..... | 15.8 | ..... | 15.4 | ..... | 13.4 | ..... | 13.1 | ..... | 13.8 | ..... | 14.5 | ..... | 17.3 | ..... | 18.2 | 347 | 17.4 | ..... | 21.3 | ..... | 21.8 | 568 |
| Bags, except textile bags | 2643 | 12.8 | 527 | 11.7 | 711 | 11.3 | 996 | 11.5 | 793 | 10.2 | 903 | 10.1 | 923 | 9.7 | 847 | 10.9 | 936 | 11.0 | ..... | 12.2 | 436 | 15.5 | 832 | 12.4 | 1,134 |
| Die cut paper and paperboard; and cardboard | 2645 | 13.5 | ..... | 14.9 | ..... | 14.6 | ..... | 12.7 | ..... | 13.9 | ..... | 13.8 | ..... | 12.3 | ..... | ..... | ..... | ..... | ..... | 14.3 | ..... | 19.8 | ..... | 20.4 | ..... |
| Pressed and molded pulp goods | 2646 | ..... | ..... | ..... | ..... | 15.2 | ..... | 16.1 | ..... | 14.1 | ..... | 21.3 | ..... | 20.7 | ..... | ..... | ..... | 26.0 | ..... | 23.3 | ..... | 18.6 | ..... | 25.7 | ..... |
| Converted paper and paperboard products, n.e.c. | 2649 | 14.3 | ..... | 17.6 | 786 | 15.8 | 1,110 | 14.2 | ..... | 14.5 | 705 | 15.5 | 398 | 19.7 | 510 | 17.7 | 672 | 10.6 | 342 | 18.0 | 545 | 19.4 | 1,01[illegible] | 16.4 | 673 |
| Paperboard containers and boxes | 265 | 13.9 | 683 | 14.9 | 637 | 14.7 | 777 | 15.6 | 830 | 15.3 | 638 | 14.7 | 739 | 15.7 | 780 | 14.3 | 769 | 16.8 | 752 | 16.2 | 859 | 18.9 | 94[illegible] | 16.9 | 1,031 |
| Folding paperboard boxes | 2651 | 14.6 | 819 | 15.5 | 645 | 16.3 | 784 | 16.9 | 847 | 16.5 | 533 | 16.3 | 515 | 16.1 | 578 | 16.2 | 873 | 15.2 | 695 | 14.3 | 947 | 19.5 | 867 | 17.0 | 789 |
| Set-up paperboard boxes | 2652 | 13.5 | ..... | 13.9 | ..... | 13.0 | ..... | 16.2 | 556 | 15.6 | ..... | 14.9 | ..... | 19.0 | 530 | 19.1 | 459 | 19.1 | ..... | 19.9 | 623 | 18.6 | ..... | 25.4 | ..... |
| Corrugated and solid fiber boxes | 2653 | 15.6 | 549 | 17.2 | 733 | 16.1 | 1,022 | 16.9 | 951 | 16.3 | 749 | 16.0 | 1,018 | 16.4 | 1,014 | 14.3 | 734 | 19.3 | 871 | 19.0 | 978 | 22.4 | 1,110 | 18.7 | 1,259 |
| Sanitary food containers | 2654 | 10.0 | ..... | 10.6 | ..... | 9.1 | ..... | 9.9 | ..... | 10.5 | ..... | 9.9 | ..... | 10.4 | ..... | 8.3 | ..... | 10.6 | ..... | 11.1 | ..... | 11.5 | ..... | 10.5 | ..... |
| Fiber cans, tubes, drums, and similar products | 2655 | 10.1 | ..... | 9.8 | ..... | 13.0 | ..... | 13.6 | ..... | 14.6 | ..... | 12.2 | ..... | 15.7 | ..... | 15.1 | ..... | 16.7 | ..... | 10.9 | ..... | 11.1 | ..... | 8.0 | ..... |
| Building paper and building board mills | 266 | 8.6 | ..... | 8.9 | ..... | 9.4 | ..... | 9.8 | ..... | 10.8 | ..... | 12.2 | ..... | 10.7 | ..... | 14.2 | 620 | 11.6 | ..... | 9.5 | ..... | 11.5 | ..... | 10.3 | ..... |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Printing, publishing, and allied industries | 27 | 8.8 | 361 | 9.5 | 380 | 9.9 | 440 | 9.8 | 467 | 9.5 | 346 | 9.9 | 435 | 10.0 | 445 | 10.6 | 464 | 10.4 | 348 | 10.4 | 470 | 11.4 | 368 | 11.7 | 411 |
| Newspapers: publishing and printing | 271 | 9.2 | 353 | 9.3 | 447 | 9.5 | 534 | 9.1 | 514 | 8.7 | 465 | 9.4 | 370 | 9.8 | 493 | 10.5 | 602 | 9.6 | 352 | 10.7 | 358 | 11.2 | 450 | 12.0 | 555 |
| Periodicals: publishing and printing | 272 | 6.7 | 525 | 7.3 | 154 | 9.6 | 335 | 9.0 | 253 | 7.7 | 257 | 7.8 | 248 | 7.2 | 282 | 6.1 | ..... | 7.6 | 305 | 8.7 | ..... | 7.8 | ..... | 6.8 | ..... |
| Books | 273 | 7.2 | 398 | 8.4 | 269 | 9.9 | 333 | 9.0 | 191 | 9.5 | 283 | 10.2 | 533 | 8.9 | 710 | 8.8 | 229 | 10.0 | 294 | 9.2 | 427 | 9.9 | 419 | 9.6 | 309 |
| Books: publishing, publishing and printing | 2731 | 5.9 | ..... | 6.9 | ..... | 7.9 | ..... | 7.1 | ..... | 7.3 | ..... | 7.8 | ..... | 6.9 | ..... | 6.6 | ..... | 6.6 | ..... | 7.2 | ..... | 8.2 | 465 | 6.6 | ..... |
| Book printing | 2732 | 8.7 | ..... | 10.3 | ..... | 12.4 | 381 | 11.9 | ..... | 12.8 | ..... | 13.8 | 1,103 | 11.9 | ..... | 11.2 | ..... | 13.8 | ..... | 11.5 | ..... | 11.8 | ..... | 12.9 | ..... |
| Miscellaneous publishing | 274 | 5.8 | ..... | 8.7 | ..... | 7.0 | ..... | 5.2 | ..... | 6.2 | ..... | 7.1 | ..... | 6.9 | ..... | 11.0 | ..... | 7.8 | ..... | 6.8 | ..... | 7.4 | ..... | 6.6 | ..... |
| Commercial printing | 275 | 9.2 | 318 | 10.2 | 384 | 10.7 | 463 | 11.4 | 613 | 11.0 | 297 | 10.7 | 543 | 11.4 | 403 | 11.9 | 468 | 12.1 | 424 | 12.4 | 520 | 13.4 | 359 | 13.4 | 377 |
| Commercial printing, except lithograph | 2751 | 9.1 | 321 | 9.6 | 430 | 9.9 | 512 | 10.4 | 679 | 10.5 | 268 | 9.8 | 452 | 10.6 | 298 | 11.0 | 455 | 11.2 | 450 | 10.9 | 344 | 12.8 | 394 | 12.5 | 404 |
| Commercial printing, lithographic | 2752 | 9.3 | 298 | 11.0 | 267 | 12.4 | 373 | 13.9 | 500 | 12.4 | 383 | 12.9 | 780 | 13.0 | 632 | 13.8 | 479 | 14.0 | 397 | 14.9 | 865 | 14.5 | 331 | 14.8 | 347 |
| Engraving and plate printing | 2753 | 11.1 | ..... | 16.2 | ..... | 12.7 | ..... | 9.6 | ..... | 9.1 | ..... | 8.3 | ..... | 9.4 | ..... | 12.5 | ..... | 9.7 | ..... | 13.7 | ..... | 15.3 | ..... | 14.9 | ..... |
| Manifold business forms | 276 | 9.7 | ..... | 10.2 | ..... | 9.1 | ..... | 9.1 | ..... | 10.5 | ..... | 11.8 | ..... | 11.0 | ..... | 11.7 | ..... | 13.2 | ..... | 10.4 | ..... | 13.6 | ..... | 13.2 | ..... |
| Greeting cards | 277 | 9.6 | ..... | 10.7 | ..... | 10.2 | ..... | 7.3 | ..... | 9.7 | ..... | 9.6 | ..... | 10.2 | ..... | 13.8 | 585 | 10.7 | 483 | 9.5 | 389 | 8.4 | 158 | 9.5 | 140 |
| Bookbinding and related industries | 278 | 10.1 | ..... | 12.5 | ..... | 13.2 | ..... | 14.1 | ..... | 12.6 | ..... | 15.4 | ..... | 12.1 | ..... | 13.3 | 377 | 15.7 | 581 | 14.7 | ..... | 15.6 | 423 | 16.4 | 542 |
| Blankbooks, loose leaf binders and devices | 2782 | 10.1 | ..... | 12.7 | ..... | 13.5 | ..... | 13.1 | ..... | 10.4 | ..... | 13.6 | ..... | 14.2 | ..... | 13.3 | ..... | 15.6 | ..... | 14.4 | ..... | 17.1 | ..... | 14.2 | ..... |
| Bookbinding, and miscellaneous related work | 2789 | 10.2 | ..... | 12.3 | ..... | 12.9 | ..... | 14.9 | ..... | 14.2 | ..... | 16.7 | ..... | 10.6 | ..... | 13.3 | ..... | 15.8 | ..... | 15.0 | ..... | 14.2 | ..... | 18.1 | ..... |
| Service industries for the printing trade | 279 | 7.2 | ..... | 6.8 | ..... | 5.8 | ..... | 5.6 | ..... | 5.4 | ..... | 6.0 | ..... | 6.2 | ..... | 6.4 | ..... | 7.3 | ..... | 5.5 | ..... | 4.4 | ..... | 5.7 | ..... |
| Photoengraving | 2793 | 5.5 | ..... | 6.2 | ..... | 6.2 | ..... | 5.2 | ..... | 5.3 | ..... | 4.2 | ..... | 5.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4.4 | ..... | ..... | ..... |
| Chemicals and allied products | 28 | 7.5 | 741 | 7.4 | 758 | 7.7 | 523 | 7.6 | 527 | 7.5 | 652 | 7.2 | 599 | 7.5 | 679 | 7.4 | 590 | 7.7 | 571 | 7.8 | 695 | 8.1 | 528 | 8.5 | 562 |
| Industrial chemicals | 281 | 4.5 | 750 | 4.5 | 710 | 4.8 | 550 | 4.7 | 519 | 4.9 | 698 | 4.8 | 572 | 4.8 | 659 | 5.2 | 456 | 5.4 | 602 | 5.7 | 782 | 5.7 | 622 | 6.0 | 567 |
| Alkalies and chlorine | 2812 | 5.5 | ..... | 5.0 | ..... | 4.4 | ..... | 4.9 | ..... | 4.6 | ..... | 3.7 | ..... | 4.5 | ..... | ..... | ..... | 3.9 | ..... | 3.5 | ..... | 6.2 | ..... | 5.1 | ..... |
| Industrial gases | 2813 | 10.0 | ..... | 10.7 | 1,621 | 10.4 | 748 | 11.4 | ..... | 10.1 | ..... | 8.3 | ..... | 9.7 | ..... | 6.4 | ..... | 8.0 | ..... | ..... | ..... | 4.8 | 851 | 7.0 | 275 |
| Cyclic intermediates and crudes | 2815 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9.0 | ..... | 7.1 | 520 | 10.2 | 652 |
| Inorganic pigments | 2816 | 8.4 | ..... | 8.7 | ..... | 7.6 | ..... | 7.3 | ..... | 6.8 | ..... | 7.7 | ..... | 6.8 | ..... | 10.1 | ..... | 9.9 | ..... | 9.8 | ..... | 10.3 | ..... | 8.9 | ..... |
| Industrial organic chemicals, n. e. c. | 2818 | 2.8 | ..... | 3.5 | 707 | 3.6 | 413 | 3.1 | 536 | 3.1 | 720 | 3.4 | 642 | 3.2 | ..... | 3.1 | ..... | 4.5 | 351 | 4.7 | ..... | 4.9 | 695 | 4.3 | 334 |
| Industrial inorganic chemicals, n. e. c. | 2819 | 4.3 | 1,208 | 3.2 | 680 | 4.3 | 517 | 4.2 | 398 | 5.1 | 836 | 4.9 | ..... | 4.9 | 440 | 5.0 | ..... | 5.0 | ..... | 6.0 | 442 | 5.7 | 415 | 6.4 | 866 |
| Plastics and synthetic materials | 282 | 4.3 | 716 | 4.6 | 670 | 4.0 | 418 | 4.3 | 265 | 4.4 | 441 | 4.1 | 376 | 3.9 | 341 | 3.7 | 380 | 3.4 | 289 | 3.4 | 399 | 3.1 | 372 | 2.8 | 251 |
| Plastics materials; synthetic resins | 2821 | 5.9 | 900 | 6.1 | 1,217 | 5.2 | 474 | 5.7 | 392 | 6.1 | 526 | 5.9 | 568 | 5.3 | 330 | 5.8 | 608 | 4.9 | 356 | 5.6 | 567 | 5.0 | 627 | 4.5 | 277 |
| Synthetic rubber | 2822 | ..... | ..... | ..... | ..... | 3.5 | 258 | 4.8 | 205 | 3.7 | ..... | 3.6 | ..... | 4.0 | ..... | 4.3 | ..... | 3.9 | ..... | 3.6 | ..... | 2.5 | ..... | ..... | ..... |
| Cellulosic man-made fibers | 2823 | 3.7 | 542 | 5.1 | 197 | 3.5 | 330 | 4.4 | 190 | 4.8 | 271 | 4.1 | 374 | 3.7 | ..... | ..... | ..... | 3.5 | ..... | ..... | ..... | 2.2 | 322 | 1.8 | ..... |
| Synthetic organic fibers, except cellulosic | 2824 | .9 | ..... | .5 | ..... | 1.1 | ..... | 1.4 | ..... | 1.0 | ..... | .7 | ..... | 1.2 | ..... | 1.0 | ..... | .9 | ..... | 1.1 | ..... | 1.2 | ..... | 0.8 | ..... |
| Drugs | 283 | 7.6 | 287 | 6.8 | 454 | 6.6 | 241 | 6.1 | 191 | 6.6 | 340 | 5.9 | 271 | 7.6 | 272 | 7.1 | 330 | 7.5 | 242 | 7.3 | 298 | 7.7 | 317 | 9.5 | ..... |
| Biological products | 2831 | ..... | ..... | ..... | ..... | 5.9 | 63 | 5.2 | ..... | 5.8 | ..... | 4.8 | ..... | 5.7 | ..... | ..... | ..... | 8.1 | ..... | ..... | ..... | 5.7 | ..... | 5.1 | ..... |
| Medicinal chemicals and botanical products | 2833 | 6.1 | ..... | 7.3 | ..... | 7.9 | ..... | 7.5 | 483 | 11.1 | 565 | 7.7 | ..... | 9.9 | ..... | 5.7 | ..... | ..... | ..... | 8.6 | ..... | 5.5 | ..... | 8.5 | ..... |
| Pharmaceutical preparations | 2834 | 7.7 | 248 | 6.7 | 263 | 6.3 | 233 | 6.0 | 157 | 5.9 | 338 | 5.8 | 301 | 7.5 | 202 | 6.5 | 320 | 7.1 | 229 | 6.5 | 178 | 8.4 | 260 | 10.2 | 208 |
| Soap, cleaners, and toilet goods | 284 | 9.8 | 452 | 9.8 | 749 | 10.5 | 795 | 12.5 | 495 | 11.6 | 403 | 10.6 | 543 | 10.3 | 329 | 10.5 | 326 | 11.2 | 572 | 11.8 | 474 | 12.4 | 457 | 15.1 | 449 |
| Soap and other detergents | 2841 | 6.3 | ..... | 6.3 | ..... | 7.4 | ..... | 9.5 | 333 | 7.9 | ..... | 8.1 | ..... | 8.4 | ..... | 6.0 | ..... | 8.6 | ..... | 8.6 | ..... | 8.8 | ..... | 13.6 | ..... |
| Specialty cleaning and sanitation preparations | 2842 | 13.6 | ..... | 10.3 | ..... | 10.3 | ..... | 15.7 | ..... | 12.9 | ..... | 9.9 | ..... | 9.6 | ..... | 15.3 | ..... | 11 9 | ..... | 11.4 | ..... | 12.4 | ..... | 11.3 | ..... |
| Cosmetics and other toilet preparations | 2844 | 10.9 | ..... | 11.1 | 460 | 12.4 | 284 | 12.0 | 506 | 13.5 | 283 | 12.9 | 316 | 11.3 | 281 | 10.0 | 365 | 12.7 | 338 | 13.1 | 311 | 14.1 | 330 | 15.7 | 412 |
| Paints, varnishes, and allied products | 285 | 11.8 | 339 | 11.4 | 712 | 11.5 | 494 | 11.4 | 728 | 10.7 | 438 | 10.6 | 400 | 12.2 | 547 | 11.5 | 401 | 13.2 | 453 | 13.5 | 701 | 13.8 | 528 | 13.6 | 559 |
| Gum and wood chemicals | 286 | 19.3 | ..... | 19.1 | ..... | 16.2 | ..... | 14.2 | ..... | 15.9 | ..... | 15.4 | ..... | 16.9 | ..... | 12.8 | ..... | 15.4 | ..... | 12.0 | ..... | ..... | ..... | 9.3 | ..... |
| Agricultural chemicals | 287 | 16.2 | 2,373 | 15.1 | 1,983 | 16.1 | 1,134 | 13.3 | 991 | 13.3 | 2,300 | 13.9 | 1,428 | 14.5 | 2,963 | 14.7 | 1,767 | 15.4 | 1,535 | 15.7 | 2,711 | 12.6 | 1,276 | 11.9 | 1,777 |
| Fertilizers | 2871 | 13.0 | ..... | 12.9 | ..... | 12.7 | 1,314 | 11.1 | ..... | 11.5 | ..... | 12.6 | 1,438 | 13.7 | ..... | 13.4 | 1,801 | 15.5 | ..... | 14.7 | ..... | 10.9 | ..... | 8.9 | ..... |
| Fertilizers, mixing only | 2872 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18.5 | ..... | ..... | ..... | ..... | ..... | 19.7 | ..... | 22.0 | ..... | 15.4 | ..... | ..... | ..... |
| Agricultural pesticides and other chemicals, n. e. c. | 2879 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.3 | ..... | 11.7 | ..... | 12.9 | ..... | 10.9 | ..... | 11.5 | ..... | 12.8 | ..... | 12.0 | ..... |
| Miscellaneous chemical products | 289 | 11.9 | 1,051 | 14.4 | 890 | 15.3 | 361 | 14.0 | 680 | 12.9 | 639 | 13.2 | 1,447 | 13.6 | 926 | 12.7 | 1,644 | 11.1 | 1,067 | 11.3 | 741 | ..... | ..... | 13.4 | 1,094 |
| Glue and gelatin | 2891 | 17.2 | ..... | 18.8 | ..... | 19.9 | ..... | 23.7 | ..... | 20.1 | ..... | 24.0 | ..... | 22.5 | ..... | 23.4 | ..... | 21.7 | ..... | 27.5 | ..... | ..... | ..... | 24.9 | ..... |
| Explosives | 2892 | 2.7 | ..... | 3.1 | ..... | 2.4 | ..... | 1.8 | ..... | 2.2 | ..... | 2.8 | ..... | 2.4 | ..... | 2.0 | ..... | 1.6 | ..... | 1.8 | ..... | 2.4 | ..... | 1.4 | ..... |
| Printing | 2893 | 13.3 | ..... | 17.5 | ..... | 18.6 | ..... | 20.5 | ..... | 18.3 | ..... | 16.0 | ..... | 16.6 | ..... | 15.0 | ..... | 12.7 | ..... | 16.5 | ..... | ..... | ..... | 17.2 | ..... |
| Chemicals and chemical preparations, n. e. c. | 2899 | 12.1 | ..... | 14.2 | ..... | 16.2 | ..... | 14.6 | ..... | 13.7 | ..... | 14.6 | ..... | 15.0 | ..... | 17.8 | ..... | 17.9 | 1,146 | 16.2 | 873 | 19.2 | 818 | 16.9 | ..... |



See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Petroleum refining and related industries | 29 | 6.7 | 829 | 6.8 | 828 | 7.6 | 823 | 7.7 | 804 | 8.1 | 659 | 8.3 | 880 | 8.6 | 993 | 8.3 | 1,036 | 9.5 | 1,064 | 8.6 | 821 | 10.8 | 979 | 11.3 | 1,116 |
| Petroleum refining [4] | 291 | 5.6 | 759 | 5.0 | 544 | 5.9 | 858 | 6.2 | 810 | 6.4 | 703 | 6.1 | 618 | 6.3 | 880 | 5.9 | 771 | 6.3 | 896 | 6.0 | 839 | 6.5 | 902 | 6.3 | 1,034 |
| Paving and roofing materials | 295 | 11.3 | ..... | 13.4 | 2,804 | 14.5 | ..... | 11.4 | ..... | 13.8 | ..... | 14.0 | ..... | ..... | ..... | 15.0 | 2,238 | 15.2 | 1,735 | 11.6 | 802 | ..... | ..... | 23.0 | 1,540 |
| Paving mixtures and blocks | 2951 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12.7 | ..... | ..... | ..... | 24.9 | ..... |
| Asphalt felts and coatings | 2952 | 8.5 | ..... | 7.6 | ..... | 8.1 | ..... | 7.6 | ..... | 10.8 | ..... | 9.0 | ..... | ..... | ..... | 11.1 | ..... | 19.1 | ..... | 10.9 | ..... | 20.4 | ..... | 22.0 | ..... |
| Rubber and miscellaneous plastics products | 30 | 8.7 | 549 | 10.0 | 640 | 9.8 | 798 | 10.4 | 822 | 11.5 | 703 | 11.7 | 664 | 12.3 | 800 | 14.1 | 771 | 16.4 | 739 | 15.6 | 794 | 17.7 | 789 | 18.6 | 795 |
| Tires and inner tubes | 301 | 3.3 | 335 | 4.4 | 493 | 4.4 | 667 | 5.2 | 869 | 5.1 | 445 | 6.1 | 679 | 5.2 | 452 | 5.5 | 463 | 8.8 | 431 | 9.3 | 876 | 9.1 | 564 | 13.9 | 645 |
| Rubber footwear | 302 | 6.2 | 206 | 8.3 | 313 | 8.3 | 394 | 5.7 | ..... | 4.0 | ..... | 4.9 | ..... | 4.9 | ..... | 5.8 | ..... | ..... | ..... | 11.4 | ..... | 15.6 | 704 | 10.1 | ..... |
| Fabricated rubber products, n.e.c. | 306 | 9.3 | 704 | 10.0 | 697 | 10.1 | 867 | 10.2 | 780 | 10.4 | 881 | 11.2 | 676 | 12.9 | 908 | 12.4 | 637 | 16.6 | 869 | 15.3 | 803 | 18.4 | 763 | 19.1 | 823 |
| Miscellaneous plastics products | 307 | 13.7 | 649 | 15.5 | 783 | 14.5 | 792 | 14.8 | 846 | 17.3 | 781 | 16.3 | 728 | 16.2 | 975 | 20.3 | 1,049 | 19.7 | 797 | 18.9 | 712 | 21.3 | 915 | 20.8 | 866 |
| Leather and leather products | 31 | 10.9 | 433 | 11.4 | 430 | 11.8 | 416 | 12.7 | 381 | 12.5 | 384 | 13.3 | 420 | 13.4 | 413 | 13.8 | 406 | 14.8 | 490 | 15.5 | 455 | 15.1 | 546 | 15.2 | 534 |
| Leather tanning and finishing | 311 | 22.8 | 1,602 | 24.6 | 1,249 | 27.0 | 1,498 | 30.4 | 1,288 | 30.6 | 1,075 | 32.9 | 1,502 | 32.7 | 1,057 | 37.0 | 1,229 | 38.2 | 1,292 | 38.8 | 1,402 | 40.9 | 1,335 | 38.5 | 1,913 |
| Industrial leather belting and packing | 312 | 9.3 | ..... | 6.0 | ..... | 11.2 | ..... | 9.0 | ..... | 8.5 | ..... | 9.1 | ..... | 7.4 | ..... | 7.1 | ..... | 8.6 | ..... | 9.5 | ..... | 10.0 | ..... | 9.7 | ..... |
| Boot and shoe cut stock and findings | 313 | 17.1 | ..... | 21.3 | ..... | 22.4 | ..... | 22.1 | ..... | 23.2 | ..... | 21.1 | ..... | 21.9 | ..... | 21.3 | ..... | 17.0 | ..... | 22.3 | ..... | 31.0 | ..... | 24.1 | ..... |
| Footwear, except rubber | 314 | 8.5 | 274 | 8.9 | 279 | 9.1 | 306 | 9.9 | 209 | 9.5 | 272 | 10.3 | 267 | 10.3 | 218 | 10.5 | 290 | 11.9 | 312 | 12.6 | 306 | 12.0 | 335 | 13.0 | 336 |
| Footwear, not house slippers or rubber footwear | 3141 | 8.3 | 271 | 8.8 | 279 | 8.8 | 293 | 9.7 | 199 | 9.1 | 269 | 10.1 | 268 | 10.1 | 185 | 10.3 | 291 | 11.6 | 311 | 12.4 | 304 | 11.8 | 340 | 12.6 | 331 |
| House slippers | 3142 | 11.1 | ..... | 10.1 | ..... | 14.9 | ..... | 13.8 | ..... | 16.8 | ..... | 15.5 | ..... | 13.6 | ..... | 15.3 | ..... | 19.2 | ..... | 14.9 | ..... | 15.3 | ..... | 18.8 | ..... |
| Leather gloves and mittens | 315 | 7.1 | ..... | 5.1 | ..... | 5.7 | ..... | 5.3 | ..... | 5.8 | ..... | 9.6 | ..... | 7.0 | ..... | 5.9 | ..... | 6.9 | ..... | 6.3 | ..... | 6.7 | ..... | 7.7 | ..... |
| Luggage | 316 | 13.5 | ..... | 15.1 | ..... | 13.5 | ..... | 13.8 | ..... | 12.8 | ..... | 15.3 | ..... | 15.8 | ..... | 15.1 | ..... | 13.1 | ..... | 15.4 | ..... | 13.9 | ..... | 11.8 | ..... |
| Handbags and other personal leather goods | 317 | 9.5 | ..... | 9.1 | ..... | 10.5 | ..... | 11.9 | ..... | 12.2 | ..... | 10.2 | ..... | 12.2 | ..... | 12.0 | ..... | 12.8 | 651 | 14.6 | 351 | 12.7 | 329 | 11.8 | ..... |
| Women's handbags and purses | 3171 | 9.4 | ..... | 9.0 | ..... | 11.3 | ..... | 12.0 | ..... | 13.8 | ..... | 12.6 | ..... | 12.1 | ..... | 11.6 | ..... | 12.5 | ..... | 14.5 | ..... | 12.5 | ..... | 10.9 | ..... |
| Personal leather goods, not handbags or purses | 3172 | 9.7 | ..... | 9.3 | ..... | 9.2 | ..... | 11.6 | ..... | 9.3 | ..... | 7.1 | ..... | ..... | ..... | 15.7 | ..... | 16.3 | ..... | 14.9 | ..... | 13.3 | ..... | 13.4 | ..... |
| Stone, clay, and glass products | 32 | 18.5 | 1,364 | 18.3 | 1,688 | 18.0 | 1,480 | 17.9 | 1,313 | 17.9 | 1,537 | 18.3 | 1,105 | 18.7 | 1,247 | 20.2 | 1,254 | 20.4 | 1,438 | 21.6 | 1,212 | 22.4 | 1,486 | 23.8 | 1,540 |
| Flat glass | 321 | 14.1 | 661 | 10.9 | 622 | 10.0 | 316 | 9.4 | 377 | 9.0 | 497 | 8.5 | 627 | 11.2 | 472 | 6.1 | ..... | 6.2 | ..... | 9.0 | 593 | 8.5 | 444 | 7.9 | 389 |
| Glass and glassware, pressed or blown | 322 | 7.2 | 571 | 8.8 | 620 | 8.1 | 459 | 8.0 | 552 | 8.4 | 471 | 7.9 | 515 | 9.0 | 546 | 9.0 | 574 | 8.7 | 674 | 10.4 | 356 | 11.7 | 727 | 14.3 | 611 |
| Glass containers | 3221 | 7.0 | 544 | 8.7 | 599 | 7.7 | 603 | 8.4 | 464 | 8.4 | 431 | 8.6 | 486 | 9.5 | 585 | 9.9 | 668 | 8.9 | 760 | 10.6 | 306 | 11.6 | 845 | 16.1 | 740 |
| Pressed and blown glass and glassware, n.e.c. | 3229 | 7.5 | 611 | 9.0 | 649 | 8.8 | 243 | 7.5 | ..... | 8.4 | 531 | 6.9 | ..... | 8.4 | ..... | 9.4 | ..... | 8.5 | ..... | 10.3 | ..... | 11.9 | ..... | 11.8 | 429 |
| Glass products, made of purchased glass | 323 | 10.7 | 789 | 9.9 | 535 | 8.8 | 654 | 9.4 | ..... | 8.6 | ..... | 8.9 | ..... | 10.0 | ..... | 10.7 | ..... | 10.3 | ..... | 10.3 | ..... | 10.3 | ..... | 16.5 | 591 |
| Cement [4] | 324 | 4.1 | ..... | 4.6 | ..... | 3.9 | ..... | 4.0 | ..... | 5.1 | ..... | 5.4 | ..... | 5.7 | ..... | 5.6 | 1,105 | 6.2 | 932 | 6.9 | ..... | 6.2 | ..... | 6.8 | ..... |
| Structural clay products | 325 | 31.2 | 2,133 | 31.1 | 1,842 | 31.5 | 2,082 | 30.6 | 1,538 | 30.7 | 1,548 | 31.1 | 1,515 | 32.8 | 1,438 | 31.4 | 1,443 | 29.6 | 1,767 | 30.5 | 1,706 | 31.8 | 1,665 | 30.5 | 1,500 |
| Brick and structural clay tile | 3251 | 35.2 | 2,075 | 36.5 | 2,237 | 37.6 | 2,416 | 35.1 | 1,880 | 34.6 | 1,581 | 38.4 | 1,738 | 41.6 | 1,338 | 39.9 | 2,201 | 35.5 | 2,161 | 36.0 | 1,454 | 37.7 | 1,865 | 38.5 | 1,716 |
| Ceramic wall and floor tile | 3253 | 19.8 | ..... | 19.7 | ..... | 20.5 | ..... | 21.1 | ..... | 19.3 | ..... | 14.7 | ..... | 17.3 | ..... | 15.9 | ..... | 15.7 | ..... | 17.6 | ..... | 21.7 | ..... | 17.4 | ..... |
| Clay refractories | 3255 | 22.4 | 2,602 | 21.9 | 1,670 | 20.7 | ..... | 23.2 | ..... | 23.8 | ..... | 22.7 | 886 | 20.0 | ..... | 19.8 | ..... | 23.7 | ..... | 23.8 | ..... | 28.1 | ..... | 25.9 | ..... |
| Structural clay products, n.e.c. | 3259 | 41.3 | 2,746 | 39.8 | 2,415 | 39.5 | 3,176 | 38.4 | 1,714 | 42.3 | ..... | 41.6 | ..... | 42.3 | ..... | 42.6 | 2,473 | 42.3 | ..... | 40.5 | ..... | 31.5 | 3,044 | 29.3 | 1,662 |
| Pottery and related products | 326 | 15.7 | 688 | 15.0 | 778 | 15.7 | 640 | 17.4 | 1,211 | 16.0 | 878 | 16.8 | 1,096 | 16.9 | 1,326 | 21.1 | 709 | 25.2 | 976 | 26.0 | 653 | 25.8 | 1,030 | 25.7 | 1,630 |
| Vitreous china plumbing fixtures | 3261 | 15.3 | ..... | 14.7 | ..... | 20.6 | ..... | 23.5 | ..... | 24.5 | ..... | 23.7 | ..... | 14.7 | ..... | ..... | ..... | ..... | ..... | 38.7 | ..... | 32.2 | ..... | 31.6 | ..... |
| Vitreous china food utensils | 3262 | 14.3 | 231 | 13.3 | ..... | 13.3 | ..... | 12.0 | ..... | 12.9 | ..... | 11.0 | ..... | 12.5 | ..... | 13.6 | ..... | 16.7 | ..... | 18.0 | ..... | 25.8 | ..... | 31.1 | 548 |
| Fine earthenware food utensils | 3263 | 10.6 | ..... | 11.8 | ..... | 12.7 | ..... | 14.3 | ..... | 14.8 | ..... | 15.8 | ..... | 14.2 | ..... | 18.0 | ..... | 22.8 | ..... | 23.8 | ..... | 35.3 | ..... | 32.0 | ..... |
| Porcelain electrical supplies | 3264 | 14.2 | ..... | 16.1 | ..... | 17.1 | ..... | 18.3 | ..... | 11.7 | ..... | 16.1 | ..... | 19.2 | ..... | 19.9 | ..... | 22.2 | ..... | 17.7 | ..... | 21.4 | ..... | 18.3 | ..... |
| Pottery products, n.e.c. | 3269 | 22.2 | ..... | 18.1 | ..... | 13.4 | ..... | 16.7 | ..... | 16.0 | ..... | 16.1 | ..... | 21.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18.7 | ..... | 21.2 | ..... |
| Concrete, gypsum, and plaster products | 327 | 30.5 | 1,888 | 28.8 | 2,942 | 28.3 | 2,197 | 27.9 | 1,949 | 28.2 | 2,712 | 28.2 | 1,712 | 27.5 | 1,621 | 30.8 | 2,019 | 30.2 | 2,635 | 31.2 | 1,947 | 32.9 | 2,392 | 36.8 | 2,843 |
| Concrete brick and block | 3271 | 39.5 | 1,818 | 33.8 | 1,931 | 35.8 | 1,459 | 36.8 | 2,393 | 39.0 | 2,647 | 37.8 | 1,803 | 39.3 | 2,478 | 36.4 | 2,789 | 34.8 | ..... | 36.7 | 2,282 | 35.4 | 2,538 | 35.8 | 3,179 |
| Concrete products, except block and brick | 3272 | 33.1 | 3,079 | 28.8 | 4,554 | 32.5 | 3,426 | 29.7 | 2,624 | 32.1 | 3,855 | 35.3 | 2,803 | 32.0 | 1,720 | 37.3 | 2,665 | 37.5 | 3,265 | 35.4 | 2,090 | 44.1 | 2,330 | 49.5 | 3,096 |
| Ready mixed concrete | 3273 | ..... | ..... | 33.2 | 2,413 | 28.9 | 1,779 | 28.4 | 1,283 | 27.3 | 1,867 | 24.5 | 1,019 | 25.2 | 1,504 | 29.3 | 1,935 | 28.7 | 2,494 | 32.8 | 1,705 | 27.8 | 2,645 | 34.1 | 2,866 |
| Lime [4] | 3274 | 19.4 | ..... | 17.7 | ..... | 16.7 | ..... | 19.1 | ..... | 13.4 | ..... | 17.4 | 1,923 | 16.2 | ..... | 19.1 | 1,880 | 17.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gypsum products | 3275 | 6.5 | ..... | 5.1 | ..... | 4.3 | ..... | 5.1 | ..... | 4.5 | ..... | 4.0 | ..... | 3.2 | ..... | 4.5 | ..... | 3.7 | ..... | 5.7 | ..... | 8.5 | ..... | 5.4 | ..... |
| Cut stone and stone products | 328 | 31.9 | ..... | 29.5 | ..... | 29.1 | ..... | 28.4 | 4,727 | 25.4 | ..... | 32.5 | ..... | 29.9 | ..... | 29.4 | ..... | 36.2 | ..... | 35.3 | ..... | 35.4 | ..... | 31.7 | ..... |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Stone, clay, and glass products—Continued | | | | | | | | | | | | | | | | | | | | | | | | | |
| Miscellaneous nonmetallic mineral products | 329 | 10.6 | 1,029 | 11.5 | 1,227 | 11.4 | 1,207 | 11.9 | 910 | 11.8 | 1,090 | 12.7 | 750 | 12.9 | 1,179 | 15.0 | 926 | 16.8 | 876 | 16.7 | 868 | 17.4 | 1,215 | 15.9 | 922 |
| Abrasive products | 3291 | 9.8 | 569 | 10.1 | 618 | 8.5 | 814 | 9.4 | 356 | 9.6 | 843 | 12.5 | 387 | 14.6 | 1,686 | 20.3 | ..... | 18.5 | ..... | 23.0 | 939 | 17.9 | 625 | 20.3 | ..... |
| Asbestos products | 3292 | 6.2 | ..... | 10.5 | ..... | 9.9 | ..... | 10.1 | ..... | 10.3 | ..... | 10.9 | ..... | 7.1 | ..... | 9.4 | ..... | 9.6 | ..... | 13.3 | ..... | ..... | ..... | 13.8 | ..... |
| Steam and other packing, and pipe covering | 3293 | 11.7 | ..... | 11.4 | ..... | 9.2 | ..... | 8.4 | ..... | 9.9 | ..... | 11.3 | ..... | 14.2 | ..... | 16.1 | ..... | 18.3 | ..... | 16.3 | ..... | 20.9 | ..... | 14.1 | ..... |
| Minerals: ground or treated | 3295 | 17.7 | ..... | 20.4 | ..... | 19.9 | ..... | 21.9 | ..... | 23.7 | ..... | 22.4 | ..... | 22.3 | ..... | 20.6 | ..... | 25.9 | 1,789 | 20.3 | ..... | 22.7 | ..... | 22.3 | ..... |
| Mineral wool | 3296 | 8.4 | ..... | 4.6 | ..... | 6.2 | ..... | 7.6 | ..... | 6.4 | ..... | 6.6 | ..... | 6.1 | ..... | ..... | ..... | ..... | ..... | 8.4 | ..... | 10.3 | ..... | 11.1 | ..... |
| Nonclay refractories | 3297 | 21.7 | ..... | 18.3 | ..... | 20.2 | ..... | 18.6 | ..... | 15.5 | ..... | 16.6 | ..... | 19.2 | ..... | 17.9 | ..... | 16.5 | ..... | 19.7 | ..... | 22.9 | ..... | 15.8 | ..... |
| Primary metal industries | 33 | 10.0 | 1,035 | 10.5 | 970 | 10.2 | 988 | 11.0 | 1,014 | 11.0 | 985 | 11.5 | 989 | 12.9 | 1,066 | 15.0 | 1,020 | 15.1 | 1,037 | 15.2 | 967 | 17.1 | 1,040 | 16.9 | 1,128 |
| Blast furnaces, steel works, basic steel products | 331 | 4.5 | 847 | 4.4 | 815 | 4.0 | 833 | 4.2 | 916 | 4.4 | 816 | 4.6 | 704 | 5.3 | 962 | 6.3 | 894 | 5.8 | 923 | 6.8 | 739 | 7.3 | 841 | 6.5 | 940 |
| Blast furnaces, steel works and rolling mills | 3312 | 3.5 | 867 | 3.5 | 774 | 3.1 | 834 | 3.2 | 848 | 3.4 | 785 | 3.4 | 673 | 3.8 | 928 | 4.9 | 782 | 3.3 | 708 | 4.2 | 622 | 4.1 | 813 | 4.0 | 541 |
| Electrometallurgical products | 3313 | 10.0 | ..... | 7.1 | ..... | 5.5 | ..... | 5.2 | ..... | 6.1 | ..... | 7.0 | ..... | 12.1 | ..... | ..... | ..... | 13.1 | ..... | 16.8 | ..... | ..... | ..... | 16.5 | ..... |
| Steel wire drawing and steel nails and spikes | 3315 | 13.3 | ..... | 14.6 | 880 | 14.3 | 689 | 14.7 | 1,650 | 14.9 | ..... | 17.3 | 1,377 | 16.9 | 530 | 27.3 | 707 | 25.9 | 1,049 | 29.7 | 1,165 | 36.4 | 849 | 30.3 | 1,364 |
| Cold rolled sheet, strip, and bars | 3316 | ..... | ..... | ..... | ..... | 12.2 | ..... | 13.8 | 663 | 16.5 | 908 | 18.2 | 1,576 | 23.8 | 1,426 | 29.7 | 703 | 25.6 | 1,076 | 30.8 | 1,382 | 25.0 | 1,048 | ..... | ..... |
| Steel pipe and tubes | 3317 | 12.6 | 1,092 | 10.8 | 541 | 10.0 | 627 | 10.2 | 1,076 | 13.0 | 987 | 11.6 | 686 | 16.4 | 951 | 21.9 | 1,201 | 16.8 | 985 | 22.0 | 1,241 | 26.9 | 799 | 22.5 | 1,272 |
| Iron and steel foundries | 332 | 20.9 | 1,281 | 23.3 | 1,300 | 21.9 | 1,026 | 23.3 | 1,337 | 23.0 | 1,004 | 25.0 | 1,193 | 26.8 | 1,325 | 28.4 | 1,465 | 29.2 | 1,496 | 27.2 | 1,222 | 29.7 | 1,346 | 33.3 | 1,439 |
| Gray iron foundries | 3321 | 24.4 | 1,423 | 26.7 | 1,236 | 24.9 | 965 | 25.9 | 1,344 | 23.6 | 1,101 | 24.5 | 1,239 | 26.6 | 1,095 | 28.3 | 1,295 | 28.8 | 1,419 | 27.9 | 1,243 | 28.7 | 1,427 | 35.9 | 1,639 |
| Malleable iron foundries | 3322 | 14.7 | 683 | 16.8 | 1,174 | 15.4 | 527 | 16.8 | 1,120 | 18.9 | 513 | 24.9 | 830 | 21.7 | 921 | 23.2 | 1,726 | 26.8 | 1,303 | 24.3 | 772 | 30.1 | 1,156 | 29.6 | 1,131 |
| Steel foundries | 3323 | 16.5 | 1,256 | 19.4 | 1,491 | 18.5 | 1,385 | 20.9 | 1,422 | 23.4 | 1,010 | 26.2 | 1,262 | 29.3 | 2,008 | 30.9 | 1,560 | 31.0 | 1,689 | 26.4 | 1,346 | 32.0 | 1,227 | 28.8 | 1,100 |
| Nonferrous primary smelting and refining [4] | 333 | 13.7 | 1,524 | 10.2 | 956 | 13.0 | 1,073 | 10.9 | 1,177 | 9.9 | ..... | 10.1 | 1,017 | 9.0 | 1,080 | 10.2 | 1,081 | 9.2 | 1,057 | 10.6 | 728 | 12.6 | 1,293 | 12.3 | 1,036 |
| Primary smelting and refining of copper | 331 | 15.9 | 1,767 | 12.7 | 1,076 | 14.1 | 1,409 | 12.5 | ..... | 12.4 | ..... | 13.1 | 735 | 10.9 | ..... | 15.4 | 1,882 | 13.5 | 1,239 | 14.3 | ..... | 15.3 | ..... | 17.5 | 2,109 |
| Primary smelting and refining of zinc | 3333 | 20.2 | 1,609 | 16.2 | ..... | 21.2 | ..... | 16.1 | ..... | 15.6 | ..... | 18.5 | 1,751 | 15.2 | ..... | 18.5 | 956 | 16.0 | 2,913 | 18.6 | ..... | ..... | ..... | 6.6 | ..... |
| Primary production of aluminum | 3334 | ..... | ..... | 6.2 | ..... | 9.5 | 860 | 8.3 | ..... | 6.6 | ..... | 5.4 | ..... | 5.4 | ..... | 4.3 | 361 | 4.6 | 902 | 5.9 | ..... | 7.5 | ..... | ..... | ..... |
| Nonferrous secondary smelting and refining | 334 | 17.5 | ..... | 21.4 | ..... | 27.9 | ..... | 27.1 | ..... | 31.8 | ..... | 32.0 | ..... | 19.4 | ..... | ..... | ..... | ..... | ..... | 41.7 | ..... | ..... | ..... | ..... | ..... |
| Nonferrous rolling, drawing and extruding | 335 | 11.0 | 1,119 | 11.5 | 729 | 10.4 | 1,078 | 11.3 | 796 | 11.7 | 821 | 12.2 | 956 | 12.6 | 963 | 14.8 | 982 | 16.1 | 876 | 15.3 | 880 | 19.5 | 959 | 17.2 | 903 |
| Rolling, drawing, and extruding of copper | 3351 | 10.1 | 1,000 | 9.7 | 1,125 | 9.9 | 963 | 10.3 | 879 | 11.7 | 1,255 | 11.8 | 1,398 | 11.4 | 1,072 | 13.1 | 990 | 13.8 | 1,134 | 13.7 | 1,131 | 14.9 | 990 | 14.3 | 823 |
| Rolling, drawing, and extruding of aluminum | 3352 | 10.2 | ..... | 12.7 | ..... | 8.1 | ..... | 9.8 | ..... | 8.6 | ..... | 10.2 | ..... | 9.9 | ..... | 12.0 | 741 | 15.5 | 634 | 16.0 | 1,122 | 26.2 | 840 | 20.0 | ..... |
| Nonferrous rolling, drawing, extruding, n.e.c | 3356 | 12.3 | ..... | 12.4 | ..... | 14.1 | ..... | 11.9 | ..... | 12.0 | ..... | 12.6 | ..... | 13.3 | ..... | 15.9 | ..... | 14.4 | ..... | 16.5 | ..... | 15.3 | ..... | 14.3 | ..... |
| Drawing and insulating of nonferrous wire | 3357 | 12.1 | 1,397 | 11.5 | 325 | 12.0 | 795 | 13.5 | 522 | 14.8 | 404 | 14.6 | 695 | 16.4 | 949 | 38.3 | 762 | 26.6 | 1,032 | 15.2 | 574 | 17.5 | 1,204 | 17.4 | 1,027 |
| Nonferrous foundries | 336 | 16.0 | 1,071 | 19.0 | 1,647 | 21.0 | 1,666 | 20.1 | 1,070 | 18.9 | 1,077 | 22.9 | 980 | 24.2 | 1,171 | 27.6 | 1,005 | 32.1 | 999 | 29.3 | 1,269 | 32.4 | 1,122 | 24.8 | 1,170 |
| Aluminum castings | 3361 | 15.4 | ..... | 18.8 | 1,139 | 22.9 | 830 | 20.3 | 1,183 | 18.9 | 940 | 23.1 | 1,245 | 28.3 | 1,240 | 28.7 | 1,026 | 30.5 | 986 | 28.3 | 1,182 | 32.6 | 1,300 | 29.6 | 1,010 |
| Brass, bronze, copper castings | 3362 | 20.0 | 657 | 21.4 | 3,356 | 20.9 | 866 | 21.5 | 1,002 | 20.5 | 1,054 | 23.4 | 891 | 28.2 | 1,517 | 30.2 | 1,206 | 31.0 | 1,135 | 29.1 | 2,002 | 30.5 | 813 | 40.5 | 1,506 |
| Nonferrous castings, n.e.c | 3369 | 13.6 | ..... | 17.3 | 1,156 | 17.7 | 3,877 | 18.5 | 947 | 17.6 | 1,374 | 22.0 | 623 | 17.3 | 758 | 23.6 | 1,356 | ..... | ..... | 31.1 | 987 | 32.7 | 1,031 | ..... | ..... |
| Miscellaneous primary metal industries | 339 | 14.1 | 1,042 | 17.8 | 1,433 | 18.5 | 1,324 | 21.4 | 1,031 | 20.0 | 997 | 28.2 | 836 | 29.2 | 1,459 | 30.1 | 1,436 | 30.3 | 1,803 | 30.6 | 1,225 | 30.8 | 1,292 | 32.9 | 2,445 |
| Iron and steel forgings | 3391 | 14.0 | 1,276 | 17.5 | 1,004 | 17.1 | 1,077 | 20.5 | 1,033 | 18.6 | 1,024 | 22.2 | 921 | 27.5 | 1,446 | 29.1 | 1,284 | 29.4 | 1,426 | 28.1 | 1,030 | 31.0 | 1,221 | 31.4 | 2,111 |
| Primary metal industries, n.e.c | 3399 | 16.5 | ..... | 21.5 | ..... | 19.7 | ..... | 25.8 | ..... | 25.6 | ..... | 25.3 | ..... | 30.8 | ..... | 36.7 | ..... | 33.5 | ..... | 37.8 | ..... | 32.2 | ..... | 36.8 | ..... |
| Fabricated metal products | 34 | 14.5 | 1,023 | 15.4 | 986 | 15.1 | 851 | 16.1 | 900 | 15.9 | 773 | 16.4 | 884 | 18.1 | 867 | 19.9 | 901 | 21.2 | 985 | 21.1 | 924 | 22.2 | 1,007 | 22.4 | 1,003 |
| Metal cans | 341 | 5.8 | 625 | 7.0 | 490 | 6.8 | 645 | 7.0 | 835 | 6.2 | 485 | 7.3 | 545 | 7.3 | 620 | 7.6 | 599 | 8.8 | 736 | 9.1 | 951 | 7.6 | 681 | 9.5 | 550 |
| Cutlery, hand tools, and general hardware | 342 | 10.2 | 491 | 11.6 | 510 | 11.3 | 569 | 12.2 | 503 | 11.9 | 466 | 13.1 | 620 | 12.7 | 627 | 15.3 | 576 | 15.9 | 677 | 17.1 | 598 | 17.6 | 685 | 18.9 | 630 |
| Cutlery | 3421 | 13.9 | ..... | 14.3 | ..... | 17.8 | 398 | 14.7 | ..... | 14.8 | ..... | 15.6 | 708 | 14.0 | ..... | 19.1 | ..... | 15.5 | ..... | 12.8 | ..... | 21.2 | ..... | 15.6 | 622 |
| Hand and edge tools | 3423 | 14.3 | 556 | 16.1 | 747 | 14.0 | 1,133 | 17.5 | 757 | 15.6 | 665 | 19.3 | 734 | 18.2 | 908 | 20.1 | 671 | 20.6 | 869 | 24.1 | 900 | 23.7 | 962 | 24.9 | 876 |
| Hand saws and saw blades | 3425 | ..... | ..... | 15.0 | ..... | 10.8 | ..... | 12.8 | ..... | 13.0 | ..... | 9.2 | ..... | 15.6 | ..... | 17.3 | ..... | 17.8 | ..... | 16.0 | ..... | 16.2 | ..... | 21.0 | ..... |
| Hardware, n.e.c | 3429 | 8.1 | 363 | 9.2 | 353 | 9.3 | 407 | 9.6 | 411 | 9.9 | 346 | 10.5 | 567 | 9.9 | 586 | 12.4 | 476 | 12.9 | 564 | 15.4 | 505 | 14.4 | 572 | 16.3 | 520 |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| **Fabricated metal products—Continued** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Heating apparatus and plumbing fixtures | 343 | 14.7 | 1,343 | 15.1 | 947 | 13.3 | 730 | 14.6 | 1,080 | 16.1 | 1,154 | 16.1 | 764 | 17.2 | 941 | 18.3 | 765 | 20.4 | 1,000 | 19.6 | 1,228 | 22.1 | 942 | 21.7 | 1,319 |
| Enameled iron and metal sanitary ware | 3431 | 13.9 | ..... | 11.8 | ..... | 11.0 | ..... | 11.6 | ..... | 13.9 | ..... | 15.0 | ..... | 14.2 | ..... | 17.3 | ..... | 22.4 | 1,728 | 19.6 | 1,248 | 23.7 | ..... | 34.8 | ..... |
| Plumbing fittings and trim (brass goods) | 3432 | 13.5 | ..... | 16.1 | ..... | 16.2 | ..... | 17.0 | ..... | 20.3 | 551 | 18.4 | 435 | 21.4 | 638 | 20.1 | 654 | 20.1 | 907 | 21.4 | 1,239 | 23.5 | 872 | 20.8 | 984 |
| Heating equipment, except electric | 3433 | 15.5 | 1,685 | 15.7 | 844 | 12.9 | 417 | 14.5 | 917 | 15.0 | 1,032 | 15.5 | 989 | 16.1 | 939 | 17.7 | 986 | 18.1 | 956 | 18.6 | 1,215 | 20.9 | 840 | 18.4 | 1,180 |
| Fabricated structural metal products | 344 | 19.9 | 1,513 | 21.5 | 1,526 | 20.6 | 1,209 | 21.7 | 1,343 | 21.8 | 1,099 | 22.6 | 1,474 | 24.8 | 1,286 | 26.9 | 1,126 | 27.8 | 1,385 | 27.9 | 1,180 | 30.0 | 1,550 | 29.0 | 1,367 |
| Fabricated structural steel | 3441 | 21.8 | 2,108 | 22.8 | 1,841 | 22.4 | 1,839 | 23.4 | 1,931 | 23.0 | 1,016 | 26.6 | 1,982 | 27.8 | 1,981 | 32.9 | 1,989 | 30.8 | 1,866 | 33.3 | 1,644 | 36.6 | 1,530 | 36.4 | 2,217 |
| Metal doors, sash, frames, molding, and trim | 3442 | 17.6 | 905 | 23.1 | 1,068 | 18.9 | 449 | 19.9 | 721 | 19.9 | 707 | 18.7 | 391 | 20.1 | 662 | 21.2 | 696 | 20.3 | 1,131 | 23.0 | 1,533 | 23.7 | 1,044 | 29.2 | 725 |
| Fabricated plate work (boiler shops) | 3443 | 18.6 | 1,502 | 19.5 | 1,423 | 17.6 | 1,447 | 18.4 | 1,557 | 18.7 | 1,507 | 19.5 | 1,288 | 24.7 | 1,440 | 24.0 | 906 | 25.8 | 1,325 | 26.0 | 1,318 | 26.0 | 1,624 | 21.2 | 962 |
| Sheet metal work | 3444 | 20.3 | 1,254 | 21.4 | 1,205 | 21.8 | 686 | 25.4 | 909 | 25.8 | 1,218 | 25.1 | 1,196 | 25.6 | 1,082 | 27.1 | 1,163 | 27.6 | 1,486 | 28.3 | 1,495 | 29.6 | 1,677 | 28.2 | 1,248 |
| Architectural & ornamental metal work | 3446 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 22.0 | ..... | 24.3 | ..... | 26.1 | ..... | 29.5 | ..... | 31.2 | 1,296 | 32.4 | 1,356 | 32.3 | 1,424 |
| Miscellaneous metal work | 3449 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 25.7 | ..... | 33.9 | ..... | 34.1 | ..... | 33.1 | ..... |
| Screw machine products, bolts, etc | 345 | 11.5 | 585 | 12.8 | 451 | 12.6 | 737 | 14.9 | 928 | 13.3 | 567 | 14.6 | 545 | 15.9 | 422 | 16.4 | 526 | 17.5 | 589 | 16.2 | 541 | 18.5 | 569 | 20.7 | 868 |
| Screw machine products | 3451 | 11.1 | ..... | 13.6 | ..... | 12.6 | ..... | 15.3 | ..... | 13.9 | ..... | 13.4 | ..... | 14.2 | 603 | 14.8 | 663 | 16.9 | 559 | 15.8 | 448 | 17.6 | 418 | 19.5 | 671 |
| Bolts, nuts, screws, rivets, and washers | 3452 | 11.9 | 708 | 12.2 | 473 | 12.7 | 655 | 14.5 | 1,188 | 12.9 | 748 | 15.5 | 595 | 17.3 | 426 | 17.7 | 541 | 17.9 | 578 | 16.4 | 633 | 19.3 | 697 | 21.7 | 1,030 |
| Metal stampings | 346 | 9.0 | 674 | 9.7 | 770 | 9.4 | 561 | 10.1 | 539 | 9.6 | 556 | 9.5 | 493 | 10.6 | 528 | 11.3 | 635 | 13.3 | 706 | 12.4 | 666 | 12.9 | 811 | 12.4 | 827 |
| Coating, engraving, and allied services | 347 | 21.0 | 1,048 | 20.6 | 926 | 22.1 | 1,220 | 23.3 | 532 | 23.3 | 665 | 21.7 | 645 | 26.3 | 839 | 30.1 | 879 | 33.0 | 1,262 | 27.3 | 844 | 29.7 | 902 | 32.0 | 904 |
| Plating, polishing, anodizing and coloring | 3471 | 20.5 | ..... | 20.9 | ..... | 24.2 | ..... | 25.3 | ..... | 23.7 | ..... | 22.1 | ..... | 28.7 | 671 | 29.8 | 899 | 30.4 | 1,149 | 29.2 | 762 | 30.0 | 846 | 35.9 | 1,077 |
| Coating, engraving, and allied services, n.e.c | 3479 | 22.3 | 917 | 19.9 | ..... | 17.3 | ..... | 18.1 | ..... | 22.5 | ..... | 20.7 | ..... | 25.2 | ..... | 30.7 | ..... | 36.4 | 1,534 | 23.0 | ..... | 28.9 | ..... | 23.7 | ..... |
| Miscellaneous fabricated wire products | 348 | 15.5 | 1,153 | 16.9 | 994 | 18.3 | 904 | 17.9 | 1,046 | 17.5 | 502 | 20.2 | 1,401 | 22.1 | 541 | 24.2 | 906 | 23.1 | 927 | 25.0 | 580 | 26.2 | 887 | 28.1 | 980 |
| Miscellaneous fabricated metal products | 349 | 13.8 | 877 | 14.9 | 1,068 | 14.3 | 622 | 15.8 | 728 | 15.9 | 901 | 15.8 | 823 | 18.5 | 1,195 | 21.3 | 772 | 22.8 | 1,026 | 24.5 | 892 | 23.8 | 826 | 21.9 | 835 |
| Metal shipping barrels, drums, kegs, and pails | 3491 | 13.4 | ..... | 13.6 | ..... | 12.0 | ..... | 15.8 | ..... | 13.5 | ..... | 15.1 | ..... | 13.4 | ..... | 20.3 | ..... | 22.9 | ..... | 22.7 | ..... | 22.7 | ..... | 29.7 | ..... |
| Steel springs | 3493 | 19.1 | ..... | 25.3 | ..... | 27.6 | ..... | 28.7 | ..... | 29.4 | ..... | 24.8 | ..... | 28.5 | ..... | 34.4 | ..... | 33.5 | ..... | 37.5 | ..... | 47.5 | ..... | ..... | ..... |
| Valves and pipe fittings | 3494 | 13.2 | 820 | 14.0 | 497 | 13.4 | 458 | 14.4 | 637 | 15.2 | 612 | 15.8 | 691 | 18.4 | 763 | 21.5 | 834 | 21.4 | 983 | 20.2 | 643 | 21.4 | 631 | 20.3 | 635 |
| Fabricated pipe and fabricated pipe fittings | 3498 | 13.8 | ..... | 15.4 | ..... | 14.6 | ..... | 13.2 | ..... | 16.5 | ..... | 17.9 | ..... | 18.5 | ..... | 21.3 | ..... | 22.9 | ..... | 21.9 | ..... | 26.4 | 1,923 | 25.7 | 837 |
| Fabricated metal products, n.e.c | 3499 | 16.8 | ..... | 15.2 | ..... | 15.0 | ..... | 17.2 | ..... | 14.4 | ..... | 14.6 | ..... | 21.2 | ..... | 26.5 | ..... | 25.3 | 869 | 23.4 | ..... | 23.2 | ..... | 17.7 | ..... |
| **Machinery, except electrical** | 35 | 9.8 | 525 | 10.8 | 626 | 10.4 | 612 | 10.7 | 586 | 10.8 | 627 | 11.4 | 547 | 11.9 | 535 | 13.4 | 564 | 13.1 | 532 | 13.2 | 533 | 14.1 | 576 | 14.0 | 583 |
| Engines and turbines | 351 | 6.9 | 482 | 6.3 | 424 | 6.2 | 418 | 6.3 | 298 | 6.0 | 309 | 6.5 | 504 | 7.4 | 382 | 7.9 | 325 | 9.3 | 422 | 8.1 | 466 | 9.8 | 509 | 6.9 | 293 |
| Steam engines, turbines and generator units | 3511 | 5.6 | 295 | ..... | ..... | 5.2 | 462 | 4.9 | 276 | 4.8 | 557 | 5.8 | ..... | 8.5 | ..... | ..... | ..... | 6.2 | ..... | 5.4 | ..... | 2.8 | ..... | ..... | ..... |
| Internal combustion engines, n.e.c | 3519 | 8.1 | 653 | 7.5 | 434 | 7.2 | 388 | 7.3 | 313 | 6.9 | 202 | 6.9 | 454 | 6.7 | 396 | 10.0 | 425 | 10.8 | 520 | 9.5 | 580 | ..... | ..... | 8.4 | 362 |
| Farm machinery and equipment | 352 | 9.3 | 596 | 10.6 | 835 | 10.2 | 701 | 10.4 | 749 | 10.3 | 695 | 10.1 | 578 | 12.1 | 646 | 11.7 | 836 | 11.6 | 851 | 13.6 | 613 | 11.4 | 803 | 12.3 | 734 |
| Construction, mining, materials-handling machinery | 353 | 11.5 | 723 | 12.5 | 633 | 12.6 | 1,061 | 12.7 | 702 | 12.7 | 706 | 14.8 | 740 | 15.2 | 619 | 17.9 | 989 | 16.4 | 723 | 17.3 | 786 | 19.7 | 702 | 20.6 | 902 |
| Construction machinery and equipment | 3531 | 9.4 | 665 | 11.3 | 823 | 11.4 | 776 | 11.2 | 860 | 12.1 | 751 | 13.7 | 574 | 13.7 | 644 | 15.9 | 946 | 15.7 | 791 | 17.1 | 942 | 18.0 | 607 | 16.4 | 675 |
| Mining machinery and equipment | 3532 | 17.3 | 1,024 | 16.0 | 446 | 15.9 | 936 | 17.9 | 425 | 15.4 | ..... | 18.8 | 828 | 19.4 | 1,235 | 21.6 | 653 | 21.6 | 1,248 | 27.8 | 704 | 32.5 | 1,198 | 27.5 | 1,056 |
| Oil field machinery and equipment | 3533 | 12.0 | 531 | 12.2 | 504 | 13.6 | 2,152 | 13.5 | 768 | 12.5 | ..... | 12.9 | ..... | 14.9 | 686 | 14.9 | ..... | 18.5 | 722 | 18.7 | 694 | 18.2 | 589 | 21.1 | 1,417 |
| Elevators and escalators | 3534 | 13.4 | ..... | 14.8 | 548 | 14.5 | ..... | 15.8 | 634 | 13.0 | ..... | 19.1 | ..... | 27.1 | ..... | 28.5 | ..... | 21.9 | ..... | 21.3 | ..... | 33.9 | ..... | 35.4 | 1,078 |
| Conveyors and conveying equipment | 3535 | 13.7 | ..... | 16.3 | ..... | 15.7 | ..... | 15.6 | ..... | 14.8 | ..... | 17.3 | ..... | 17.9 | ..... | 19.6 | ..... | 16.6 | ..... | 16.9 | ..... | ..... | ..... | 30.0 | 1,228 |
| Hoists, industrial cranes, and monorail systems | 3536 | 11.9 | ..... | 13.2 | ..... | 10.1 | ..... | ..... | ..... | ..... | ..... | 12.7 | ..... | 10.2 | 574 | 12.0 | ..... | 10.6 | 229 | 10.2 | ..... | 13.8 | ..... | 16.7 | 506 |
| Industrial trucks, tractors, and stackers | 3537 | 10.5 | ..... | 10.1 | ..... | 10.6 | ..... | 10.9 | ..... | 12.1 | ..... | 16.0 | 426 | 13.2 | 512 | 13.5 | ..... | 11.6 | ..... | 11.5 | ..... | 15.1 | ..... | 17.7 | ..... |
| Metalworking machinery and equipment | 354 | 8.4 | 495 | 9.3 | 524 | 8.9 | 575 | 9.6 | 570 | 9.5 | 533 | 10.5 | 606 | 10.6 | 593 | 12.5 | 653 | 13.2 | 501 | 12.9 | 629 | 13.9 | 581 | 14.6 | 572 |
| Machine tools, metal cutting types | 3541 | 7.7 | 219 | 8.3 | 436 | 7.5 | 532 | 9.2 | 324 | 9.3 | 490 | 10.6 | 543 | 9.6 | 579 | 11.9 | 394 | 11.8 | 387 | 12.0 | 677 | 11.5 | 659 | 10.6 | 527 |
| Machine tools, metal forming types | 3542 | 9.6 | ..... | 13.0 | ..... | 13.2 | ..... | 12.1 | ..... | 11.9 | ..... | 13.4 | ..... | 13.9 | 394 | 16.1 | 825 | 16.9 | 982 | 18.4 | 1,954 | 21.4 | 877 | 20.6 | 1,181 |
| Special dies and tools, jigs and fixtures | 3544 | 9.4 | 812 | 10.0 | 582 | 9.7 | 706 | 10.0 | 650 | 9.0 | 614 | 9.7 | 449 | 10.5 | 636 | 12.4 | 648 | 12.4 | 696 | 11.5 | 441 | 13.6 | 530 | 16.5 | 581 |
| Machine tool accessories and measuring devices | 3545 | 7.1 | ..... | 8.3 | 329 | 8.0 | ..... | 8.6 | 774 | 10.6 | 649 | 11.3 | 374 | 10.7 | 902 | 12.2 | 389 | 15.1 | 631 | 13.5 | 630 | 14.2 | 637 | 12.8 | ..... |
| Metal working machinery and power hand tools | 3548 | 8.0 | 357 | 8.4 | 923 | 8.0 | 364 | 8.0 | 335 | 7.7 | 272 | 8.8 | 410 | 9.6 | 467 | 11.9 | 643 | 12.6 | ..... | 14.0 | 459 | 13.2 | 331 | 13.8 | 547 |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Machinery, except electrical—Continued | | | | | | | | | | | | | | | | | | | | | | | | | |
| Special industry machinery | 355 | 12.8 | 716 | 14.9 | 704 | 13.9 | 642 | 13.9 | 749 | 14.1 | 921 | 14.7 | 747 | 15.0 | 613 | 15.4 | 563 | 16.6 | 684 | 15.0 | 679 | 17.8 | 738 | 16.7 | 695 |
| Food products machinery | 3551 | 11.5 | 455 | 14.3 | 572 | 14.0 | 957 | 12.4 | 440 | 13.1 | 945 | 12.8 | 536 | 14.7 | 712 | 13.6 | 588 | 16.2 | 772 | 13.9 | 495 | 19.0 | 564 | 17.4 | 470 |
| Textile machinery | 3552 | 11.4 | 482 | 14.7 | 950 | 13.6 | 591 | 15.0 | 957 | 12.8 | 533 | 15.3 | 560 | 13.9 | 602 | 16.1 | 522 | 14.7 | 577 | 15.4 | 550 | 17.3 | 955 | 15.3 | 759 |
| Woodworking machinery | 3553 | 13.8 | ..... | 18.8 | ..... | 14.7 | ..... | 13.7 | ..... | 14.1 | ..... | 16.3 | ..... | 20.2 | ..... | 17.2 | ..... | 19.0 | ..... | 12.6 | ..... | 16.2 | ..... | 22.5 | ..... |
| Paper industries machinery | 3554 | 15.3 | 692 | 18.2 | 679 | 12.9 | ..... | 11.6 | 899 | 15.0 | ..... | 16.1 | 1,558 | 15.4 | 429 | 18.0 | 1,102 | 16.4 | 739 | 15.2 | ..... | 17.1 | 783 | 18.9 | 1,044 |
| Printing trades machinery and equipment | 3555 | 12.1 | 463 | 14.8 | 992 | 14.9 | 329 | 15.1 | 835 | 14.1 | 709 | 13.1 | 633 | 13.2 | 582 | 14.1 | 435 | 16.7 | 709 | 13.9 | ..... | 17.9 | 721 | 13.5 | ..... |
| Special industry machinery, n.e.c. | 3559 | 14.0 | 1,253 | 13.3 | 547 | 13.6 | 487 | 14.3 | 767 | 15.3 | 1,274 | 15.4 | 740 | 16.0 | 708 | 15.5 | 486 | 16.2 | 565 | 16.6 | 433 | 17.5 | 6.8 | 16.9 | 731 |
| General industrial machinery and equipment | 356 | 9.7 | 446 | 10.9 | 608 | 9.9 | 584 | 10.5 | 486 | 9.9 | 713 | 11.3 | 514 | 12.3 | 490 | 14.3 | 471 | 13.3 | 564 | 13.3 | 441 | 14.3 | 580 | 14.2 | 610 |
| Pumps, compressors, and pumping equipment | 3561 | 10.5 | 253 | 12.5 | 769 | 11.3 | 808 | 11.8 | 569 | 11.6 | 901 | 11.9 | 560 | 13.7 | 608 | 15.9 | 585 | 15.7 | 466 | 13.6 | 416 | 16.0 | 627 | 14.7 | 719 |
| Ball and roller bearings | 3562 | 7.8 | 436 | 6.9 | 624 | 5.9 | 174 | 6.0 | 273 | 6.0 | 300 | 6.2 | 242 | 7.2 | 302 | 8.4 | 222 | 7.5 | 329 | 6.9 | ..... | 6.5 | 389 | 7.3 | 356 |
| Blowers, exhaust and ventilation fans | 3564 | 12.1 | 991 | 11.2 | 906 | 12.1 | 710 | 11.4 | 817 | 9.3 | ..... | 11.9 | 841 | 12.1 | 705 | 15.7 | 636 | 14.4 | 739 | 16.8 | ..... | 13.5 | 905 | 18.5 | 711 |
| Industrial patterns | 3565 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11.0 | ..... | 9.6 | ..... | 13.4 | ..... | 10.2 | ..... | 15.7 | ..... | 9.7 | ..... |
| Mechanical power transmission equipment | 3566 | 9.3 | 544 | 11.7 | 371 | 11.2 | 752 | 12.5 | 537 | 10.8 | 1,008 | 13.4 | 699 | 15.4 | 613 | 15.3 | 526 | 15.1 | 526 | 15.4 | 378 | 14.6 | 560 | 14.4 | 603 |
| Industrial process furnaces and ovens | 3567 | 9.4 | ..... | 14.0 | ..... | 9.0 | ..... | 11.2 | ..... | 12.4 | ..... | 17.1 | ..... | 12.3 | ..... | 17.5 | ..... | 14.9 | ..... | 15.7 | ..... | ..... | ..... | 16.4 | ..... |
| General industrial machinery, n.e.c. | 3569 | 10.9 | ..... | 11.8 | ..... | 11.3 | ..... | 11.6 | ..... | 11.0 | ..... | 13.3 | 469 | 12.6 | ..... | 18.9 | 461 | 14.6 | 980 | 17.5 | 723 | 21.4 | 461 | 20.5 | 546 |
| Office, computing, and accounting machines | 357 | 4.0 | 261 | 3.7 | 193 | 4.6 | 240 | 3.6 | 122 | 3.5 | 196 | 3.4 | 169 | 3.5 | 136 | 4.7 | 248 | 3.8 | 189 | 3.6 | 165 | 3.3 | 83 | 3.5 | 120 |
| Computing and related machines | 3571 | 2.6 | 306 | 2.8 | 109 | 2.9 | 147 | 2.2 | ..... | 2.3 | 132 | 2.5 | ..... | 2.6 | ..... | 3.1 | ..... | 2.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Typewriters | 3572 | 4.2 | ..... | 2.3 | ..... | 7.8 | ..... | 5.1 | ..... | 6.4 | ..... | 4.6 | ..... | 3.9 | ..... | 6.2 | ..... | 5.1 | ..... | ..... | ..... | 4.7 | ..... | ..... | ..... |
| Scales and balances, except laboratory | 3576 | 17.0 | ..... | 9.7 | ..... | 9.8 | ..... | 8.2 | ..... | 8.4 | ..... | 10.5 | ..... | 10.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 16.7 | ..... | 15.3 | ..... |
| Office machines, n.e.c. | 3579 | 7.0 | ..... | 8.4 | ..... | 9.9 | ..... | 9.3 | ..... | 6.4 | ..... | 6.5 | ..... | 8.5 | ..... | 8.1 | ..... | 6.7 | ..... | 7.9 | ..... | 7.8 | ..... | 8.3 | ..... |
| Service industry machines | 358 | 10.2 | 422 | 11.7 | 1,094 | 12.9 | 759 | 13.0 | 761 | 13.2 | 899 | 12.7 | 435 | 14.5 | 570 | 15.0 | 701 | 14.6 | 726 | 16.7 | 669 | 16.4 | 669 | 19.6 | 796 |
| Automatic merchandising machines | 3581 | 17.3 | ..... | 16.4 | ..... | 17.5 | ..... | 15.6 | ..... | 17.5 | ..... | 14.8 | ..... | 14.4 | ..... | ..... | ..... | ..... | ..... | 16.3 | ..... | 16.2 | ..... | ..... | ..... |
| Commercial laundry and dry cleaning machines | 3582 | 9.2 | ..... | 14.0 | ..... | 15.5 | ..... | 17.9 | ..... | 14.5 | ..... | 14.8 | ..... | 17.0 | ..... | 18.7 | ..... | 15.1 | ..... | 21.2 | ..... | 23.6 | ..... | 16.2 | ..... |
| Refrigeration machinery, air conditioning units | 3585 | 8.5 | 397 | 10.9 | 953 | 11.5 | 708 | 12.3 | 979 | 12.0 | 942 | 11.4 | 475 | 14.2 | 566 | 12.9 | 628 | 12.3 | 542 | 16.4 | 699 | 15.7 | 630 | 19.5 | 856 |
| Measuring and dispensing pumps | 3586 | 11.2 | ..... | 9.0 | ..... | 8.8 | ..... | 12.7 | ..... | 12.9 | ..... | 13.4 | ..... | 12.5 | ..... | 14.8 | ..... | ..... | ..... | 10.1 | ..... | 11.1 | ..... | 17.1 | ..... |
| Service industry machines, n.e.c. | 3589 | 14.4 | ..... | 12.0 | ..... | 17.7 | ..... | 11.5 | ..... | 15.6 | ..... | 15.5 | ..... | 15.3 | ..... | 17.9 | ..... | 21.3 | ..... | 19.4 | ..... | 18.8 | ..... | 20.4 | ..... |
| Miscellaneous machinery, except electrical | 359 | 14.1 | 468 | 15.3 | 707 | 13.2 | 399 | 14.9 | 779 | 16.2 | 577 | 14.4 | 722 | 14.4 | 538 | 17.9 | 696 | 17.3 | 494 | 17.5 | 456 | 17.2 | 557 | 15.5 | 556 |
| Machinery and parts, except electrical, n.e.c. | 3599 | 8.6 | 252 | 9.8 | 347 | 9.5 | 272 | 10.4 | 374 | 10.1 | 279 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Electrical machinery, equipment, and supplies | 36 | 4.9 | 282 | 5.2 | 278 | 5.2 | 278 | 5.3 | 280 | 5.3 | 222 | 5.6 | 232 | 5.9 | 246 | 6.8 | 288 | 7.4 | 307 | 7.0 | 272 | 7.6 | 333 | 8.1 | 333 |
| Electric transmission and distribution equipment | 361 | 3.8 | 279 | 5.1 | 263 | 6.8 | 290 | 5.2 | 415 | 5.2 | 171 | 5.3 | 288 | 6.0 | 224 | 6.4 | 329 | 8.2 | 373 | 6.0 | 284 | 8.2 | 431 | 8.4 | 369 |
| Electric measuring instruments | 3611 | 4.6 | ..... | 5.6 | ..... | 5.5 | ..... | 6.7 | ..... | 6.9 | ..... | 6.7 | ..... | 5.5 | ..... | 6.3 | ..... | 6.8 | ..... | 6.7 | ..... | 7.8 | 356 | 6.8 | ..... |
| Power, distribution, and specialty transformers | 3612 | 3.2 | ..... | 4.5 | ..... | 4.0 | ..... | 4.3 | ..... | 4.3 | ..... | 5.0 | ..... | 5.4 | ..... | 6.4 | ..... | 5.9 | ..... | 6.1 | ..... | 10.3 | ..... | 10.3 | ..... |
| Switchgear and switchboard apparatus | 3613 | 3.6 | 366 | 4.0 | 155 | 4.1 | 240 | 4.5 | ..... | 4.6 | 150 | 4.4 | ..... | 6.9 | ..... | 6.6 | 436 | ..... | ..... | 5.2 | 302 | 7.1 | ..... | 8.3 | ..... |
| Electrical industrial apparatus | 362 | 5.8 | 368 | 5.9 | 363 | 5.9 | 293 | 6.4 | 343 | 6.7 | 330 | 6.4 | 198 | 7.3 | 369 | 8.2 | 318 | 8.3 | 309 | 9.3 | 288 | 9.3 | 335 | 9.7 | 457 |
| Motors and generators | 3621 | 5.4 | 293 | 6.2 | 481 | 6.0 | 344 | 6.7 | 467 | 6.8 | 267 | 6.3 | 171 | 7.5 | 435 | 8.7 | 405 | 8.8 | 321 | 10.6 | 373 | 9.4 | 311 | 11.2 | 556 |
| Industrial controls | 3622 | 6.0 | 332 | 5.7 | 204 | 5.6 | 180 | 6.3 | 231 | 6.1 | 335 | 5.6 | 194 | 5.4 | ..... | 5.6 | 149 | 5.9 | 127 | 5.3 | ..... | 8.1 | 279 | 5.9 | ..... |
| Welding apparatus | 3623 | 8.5 | ..... | 9.5 | ..... | 8.5 | ..... | 8.9 | ..... | 8.2 | ..... | 12.1 | ..... | 10.9 | ..... | 15.5 | ..... | 15.8 | ..... | 14.2 | ..... | 11.8 | ..... | 8.7 | ..... |
| Carbon and graphite products | 3624 | 6.2 | ..... | 5.7 | ..... | 6.8 | ..... | 7.0 | ..... | 8.0 | ..... | 8.3 | ..... | 9.1 | ..... | 9.3 | ..... | 8.7 | ..... | 12.6 | ..... | 14.0 | ..... | 15.4 | ..... |
| Electrical industrial apparatus, n.e.c. | 3629 | 6.6 | ..... | 2.7 | ..... | 4.0 | ..... | 2.6 | ..... | 5.2 | ..... | 4.3 | ..... | 8.6 | ..... | 8.1 | ..... | 8.5 | ..... | 6.9 | ..... | 7.1 | ..... | ..... | ..... |
| Household appliances | 363 | 6.4 | 444 | 8.0 | 422 | 7.9 | 605 | 7.5 | 446 | 7.8 | 333 | 7.5 | 374 | 7.4 | 337 | 10.9 | 696 | 10.5 | 679 | 9.5 | 584 | 10.3 | 617 | 10.6 | 482 |
| Household cooking equipment | 3631 | ..... | ..... | 16.6 | ..... | 10.9 | 745 | 9.2 | 981 | 10.3 | 1,134 | 10.4 | 608 | 10.7 | 1,270 | ..... | ..... | ..... | ..... | 18.6 | ..... | 14.0 | ..... | 15.3 | ..... |
| Household refrigerators and freezers | 3632 | 3.8 | ..... | 3.7 | ..... | 3.0 | ..... | 3.4 | ..... | 3.6 | ..... | 4.3 | 288 | 4.4 | 163 | 4.1 | ..... | 4.8 | 349 | 4.4 | ..... | 5.7 | 512 | 5.4 | 325 |
| Household laundry equipment | 3633 | 4.7 | ..... | 5.7 | ..... | 6.6 | ..... | 4.8 | ..... | 4.4 | ..... | 5.4 | ..... | 6.7 | ..... | 5.2 | ..... | 6.2 | ..... | 8.5 | ..... | 8.0 | ..... | 8.6 | 564 |
| Electric housewares and fans | 3634 | 6.0 | ..... | 7.9 | ..... | 7.5 | ..... | 8.0 | ..... | 9.2 | ..... | 9.1 | ..... | 8.7 | ..... | 12.9 | ..... | 12.2 | ..... | 11.0 | ..... | 10.4 | ..... | 12.2 | ..... |
| Household vacuum cleaners | 3635 | 2.8 | ..... | 3.0 | ..... | 2.0 | ..... | 3.1 | ..... | 4.5 | ..... | 6.1 | ..... | 4.6 | 35 | ..... | ..... | ..... | ..... | 12.9 | ..... | 15.4 | ..... | 15.4 | ..... |
| Sewing machines | 3636 | 8.1 | ..... | 10.4 | ..... | 7.7 | ..... | 7.8 | ..... | 13.9 | ..... | 7.0 | ..... | 5.1 | ..... | ..... | ..... | ..... | ..... | 5.5 | ..... | 6.1 | ..... | 9.5 | ..... |
| Household appliances, n.e.c. | 3639 | 13.3 | ..... | 17.5 | ..... | ..... | ..... | 24.8 | ..... | 20.8 | ..... | 15.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Electrical machinery, equipment, and supplies—Continued | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electric lighting and wiring equipment | 364 | 8.8 | 619 | 9.5 | 402 | 8.4 | 363 | 8.6 | 476 | 9.3 | 360 | 9.8 | 355 | 9.5 | 398 | 12.4 | 425 | 13.2 | 560 | 13.8 | 437 | 13.7 | 581 | 15.8 | 632 |
| Electric lamps | 3641 | 3.6 | | 3.1 | | 3.0 | | 2.9 | | 3.8 | | 3.1 | | 2.9 | | 5.1 | | 3.6 | | 3.9 | | 4.2 | | 6.4 | |
| Lighting fixtures | 3642 | 11.8 | 559 | 11.2 | | 8.7 | | 9.8 | | 11.3 | 369 | 11.3 | 266 | 11.7 | 360 | 12.9 | 526 | 15.6 | 543 | 20.4 | 814 | 18.7 | 792 | 23.7 | 1,320 |
| Current carrying wiring devices | 3643 | 5.8 | 1,008 | 10.6 | 541 | 9.2 | 334 | 8.0 | 394 | 9.2 | 422 | 10.4 | 423 | 8.8 | 355 | 11.4 | 439 | 10.6 | 433 | 10.3 | 285 | 12.0 | 433 | 11.3 | 277 |
| Noncurrent carrying wiring devices | 3644 | 14.2 | 562 | 13.0 | 322 | 14.1 | 851 | 15.2 | 367 | 12.8 | | 14.4 | | 14.7 | | | | | | 19.8 | | 18.5 | | 22.0 | |
| Radio and television receiving sets | 365 | 4.2 | 176 | 4.2 | 222 | 4.7 | 303 | 4.9 | 207 | 4.7 | 142 | 5.3 | 258 | 5.7 | 210 | 5.1 | 177 | | | 5.4 | 227 | 7.7 | 222 | 8.1 | |
| Radio and television receiving sets | 3651 | 3.7 | 181 | 3.6 | 186 | 3.8 | 313 | 3.8 | 197 | 3.4 | 118 | 3.7 | 87 | 3.8 | 175 | 3.6 | 150 | | | 4.6 | | 5.3 | | 6.0 | |
| Phonograph records | 3652 | | | | | | | | | | | | | | | 15.3 | | | | 10.2 | | | | | |
| Communication equipment | 366 | 2.7 | 151 | 2.5 | 115 | 2.5 | 176 | 2.7 | 174 | 2.4 | 112 | 2.3 | 125 | 3.0 | 143 | 3.0 | 123 | 3.2 | 128 | 2.8 | 184 | 2.8 | 147 | 2.9 | 131 |
| Telephone and telegraph apparatus | 3661 | 1.9 | | 1.4 | | 1.4 | | 1.3 | | 1.6 | | 1.6 | | 2.4 | | 1.6 | | | | 2.1 | | 2.5 | | 2.2 | |
| Radio and television apparatus | 3662 | 3.0 | 162 | 3.0 | 119 | 3.1 | 189 | 3.2 | 191 | 2.7 | 106 | 2.6 | 131 | 3.1 | 120 | 3.4 | 116 | 3.3 | 104 | 3.0 | 190 | 2.9 | 164 | 3.3 | 96 |
| Electronic components and accessories | 367 | 5.0 | 181 | 4.9 | 265 | 4.5 | 161 | 5.9 | 154 | 5.4 | 222 | 6.3 | 231 | 5.7 | 195 | 7.1 | 200 | 6.7 | 210 | 6.5 | 154 | 7.8 | 295 | 7.2 | 232 |
| Electron tubes, receiving type | 3671 | 1.6 | 89 | 1.4 | | 1.3 | | 1.7 | | 1.3 | | 1.4 | | 2.0 | | 3.0 | | 2.2 | | | | 1.2 | | | |
| Cathode ray picture tubes | 3672 | 5.8 | | 8.2 | 215 | 5.5 | | 10.3 | | 7.2 | | 10.5 | | 8.0 | | 8.6 | | | | 7.8 | | 7.4 | | 5.2 | |
| Electron tubes, transmitting | 3673 | 5.5 | | 6.1 | | 3.8 | | 5.6 | | 4.5 | | 6.0 | | 4.9 | | | | 4.7 | | 5.6 | | 6.0 | | 7.9 | |
| Semiconductor (solid state) and related devices | 3674 | | | | | | | | | | | 4.9 | | 4.0 | | 5.6 | | 5.5 | | 2.5 | | 3.7 | | 2.5 | |
| Electronic components and accessories, n.e.c. | 3679 | 6.0 | 229 | 5.4 | 268 | 5.4 | 178 | 6.4 | 158 | 6.2 | 206 | 7.4 | 279 | 6.8 | 278 | 8.4 | 205 | 7.4 | 219 | 8.0 | 195 | 9.8 | 308 | 9.6 | 266 |
| Miscellaneous electrical equipment and supplies | 369 | 5.6 | 181 | 6.1 | 437 | 5.7 | 264 | 6.3 | 203 | 6.2 | 283 | 7.8 | 261 | 7.9 | 295 | 6.3 | 278 | | | 11.9 | 363 | 10.5 | 432 | 8.6 | 340 |
| Storage batteries | 3691 | 14.3 | 369 | 16.9 | | 17.5 | 464 | 15.9 | | 16.7 | | 21.7 | 290 | 17.0 | | | | | | | | 27.1 | | 26.7 | |
| Primary batteries, dry and wet | 3692 | 7.2 | | 5.7 | | 4.6 | | 7.1 | | 8.3 | | 9.3 | | 10.6 | | | | | | 5.3 | | 5.2 | | 6.4 | |
| X-ray apparatus and tubes | 3693 | 5.4 | | 5.0 | | 4.2 | | 5.4 | | 5.6 | | 4.0 | | 4.2 | | 4.9 | | 3.9 | | 3.8 | | 2.9 | | 3.4 | |
| Engine electrical equipment | 3694 | 3.3 | 123 | 3.2 | 185 | 3.0 | 249 | 3.7 | 269 | 3.1 | 182 | 3.8 | 234 | 4.1 | 215 | 5.1 | 231 | | | 8.4 | 416 | 7.1 | 342 | 3.2 | 280 |
| Electrical equipment and supplies, n.e.c. | 3699 | 4.2 | | 8.6 | | 5.8 | | 5.1 | | 5.2 | | 6.1 | | 11.4 | | 8.2 | | 8.8 | | 9.4 | | 6.8 | | 8.1 | |
| Transportation equipment | 37 | 6.0 | 479 | 6.1 | 530 | 5.9 | 419 | 6.1 | 400 | 6.2 | 390 | 6.9 | 374 | 6.6 | 370 | 7.1 | 435 | 7.1 | 421 | 7.4 | 423 | 8.0 | 487 | 7.9 | 488 |
| Motor vehicles and equipment | 371 | 5.5 | 348 | 5.2 | 398 | 4.7 | 313 | 4.9 | 277 | 4.7 | 266 | 4.7 | 280 | 4.7 | 229 | 4.9 | 330 | 5.4 | 301 | 5.8 | 294 | 6.1 | 414 | 5.3 | 309 |
| Motor vehicles | 3711 | 3.3 | 275 | 3.3 | 235 | 2.7 | 268 | 3.0 | 217 | 2.8 | 287 | 2.3 | 173 | 2.3 | 169 | 2.3 | 196 | 1.9 | 128 | 2.1 | 145 | 2.2 | 268 | 2.0 | 162 |
| Passenger car bodies | 3712 | 2.8 | 90 | 2.4 | 126 | 2.1 | 209 | 1.6 | 68 | 1.8 | 147 | 1.1 | 140 | 1.1 | 47 | .9 | 55 | 1.0 | 124 | .7 | 203 | .6 | 182 | .8 | 55 |
| Truck and bus bodies | 3713 | 18.1 | | 18.0 | 1,338 | 16.9 | | 16.5 | | 19.0 | 356 | 19.0 | 582 | 22.7 | 621 | 18.6 | 312 | | | 35.1 | 1,225 | 40.7 | 1,454 | 23.4 | 1,024 |
| Motor vehicle parts and accessories | 3714 | 5.7 | 330 | 5.2 | 366 | 4.9 | 299 | 4.9 | 286 | 4.4 | 223 | 4.7 | 230 | 4.7 | 243 | 5.3 | 306 | 5.6 | 304 | 6.4 | 351 | 6.0 | 386 | 5.9 | 331 |
| Truck trailers | 3715 | 21.6 | | 26.5 | | 18.4 | | 23.0 | 1,435 | 20.7 | 857 | 24.3 | 2,499 | 22.7 | 830 | | | 22.5 | | 28.6 | 557 | 27.0 | 1,898 | 24.3 | 1,484 |
| Aircraft and parts | 372 | 3.5 | 349 | 3.5 | 407 | 3.5 | 292 | 3.3 | 348 | 3.3 | 280 | 3.4 | 188 | 3.3 | 245 | 4.7 | 205 | 4.3 | 196 | 3.9 | 207 | 4.3 | 206 | 4.5 | 277 |
| Aircraft | 3721 | 3.0 | 381 | 2.6 | 478 | 2.6 | 235 | 2.4 | 341 | 2.5 | 333 | 2.9 | 197 | 2.8 | 216 | 4.9 | 203 | 3.2 | 161 | 2.6 | 199 | 3.7 | 185 | 3.8 | 299 |
| Aircraft engines and engine parts | 3722 | 3.8 | 234 | 3.8 | 373 | 3.8 | 296 | 3.8 | 302 | 3.8 | 205 | 3.6 | 124 | 3.2 | 221 | 3.9 | 225 | | | 5.0 | 175 | 5.1 | 201 | 4.8 | 215 |
| Aircraft propellers and propeller parts | 3723 | 4.9 | | 6.7 | | 3.9 | | 3.8 | 140 | 6.0 | 94 | 4.8 | 80 | 5.1 | | 5.3 | 61 | 6.8 | 80 | 6.3 | 143 | 9.3 | 192 | 9.6 | 546 |
| Aircraft parts and auxiliary equipment, n.e.c. | 3729 | 4.7 | 432 | 5.6 | 234 | 6.1 | 486 | 5.6 | 492 | 4.8 | 269 | 4.5 | 302 | 5.0 | 377 | 5.4 | 186 | 6.7 | 329 | 6.6 | 283 | 4.9 | 293 | 5.6 | 277 |
| Ship and boat building and repairing | 373 | 18.3 | 1,542 | 18.3 | 1,353 | 19.4 | 1,411 | 19.4 | 1,074 | 22.7 | 1,274 | 24.3 | 1,288 | 21.6 | 1,140 | 19.8 | 1,339 | 14.0 | 1,167 | 18.3 | 1,237 | 18.8 | 1,424 | 18.5 | 1,348 |
| Ship building and repairing | 3731 | 15.7 | 1,527 | 15.4 | 1,422 | 16.3 | 1,521 | 17.7 | 1,143 | 19.7 | 1,421 | 21.2 | 1,404 | 18.2 | 1,215 | 16.6 | 1,316 | 10.7 | 1,002 | 14.6 | 1,276 | 13.8 | 1,167 | 14.1 | 1,451 |
| Boat building and repairing | 3732 | 31.4 | 1,615 | 29.5 | 1,084 | 33.6 | 911 | 27.0 | 766 | 36.6 | 609 | 38.9 | 729 | 36.1 | 812 | 35.5 | 1,447 | 28.0 | 1,875 | 31.8 | 1,094 | 34.8 | 2,254 | 35.2 | 958 |
| Railroad equipment | 374 | 7.5 | 612 | 8.0 | 849 | 7.7 | 427 | 10.0 | 555 | 9.4 | 659 | 11.8 | 597 | 11.2 | 939 | 11.9 | 1,085 | | | 15.3 | 2,053 | 12.1 | 858 | 16.6 | 1,503 |
| Locomotives and parts | 3741 | 5.1 | 379 | 2.4 | | 2.5 | 123 | 3.6 | 301 | 3.4 | | 4.3 | 379 | 5.6 | | 2.5 | | | | 1.5 | | 1.8 | | 1.4 | |
| Railroad and street cars | 3742 | 9.4 | 801 | 11.2 | | 11.5 | | 14.4 | 730 | 13.0 | 775 | 15.5 | 704 | 14.2 | 1,302 | 16.5 | 1,341 | 19.9 | | 23.0 | 2,667 | 17.4 | 1,106 | 24.4 | 2,190 |
| Motorcycles, bicycles, and parts | 375 | 25.1 | | 47.5 | | 11.0 | | 13.3 | | 13.4 | | 15.0 | | 14.0 | | 15.0 | | 15.3 | | 14.0 | | 15.2 | | 12.5 | |
| Miscellaneous transportation equipment | 379 | | | | | | | | | | | 31.7 | | 31.6 | 1,407 | 31.1 | 2,055 | 34.7 | 2,031 | 37.6 | 1,594 | 39.9 | 1,801 | 33.3 | 1,559 |
| Trailer coaches | 3791 | | | | | | | | | | | 34.0 | | 30.9 | 1,353 | 32.7 | 2,493 | 32.2 | 2,307 | 37.5 | 1,778 | 39.5 | 2,128 | 34.9 | 1,719 |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Instruments and related products | 38 | 5.5 | 261 | 5.8 | 298 | 6.0 | 265 | 5.5 | 290 | 6.1 | 247 | 5.9 | 219 | 6.2 | 237 | 7.0 | 314 | 7.8 | 283 | 7.8 | 374 | 8.2 | 256 | 7.9 | 270 |
| Engineering and scientific instruments | 381 | 4.8 | 208 | 4.3 | 183 | 4.3 | 213 | 4.0 | 154 | 5.2 | 180 | 3.7 | 177 | 4.2 | 152 | 4.4 | 135 | 5.9 | 399 | 5.9 | 162 | 6.4 | 212 | 5.8 | ..... |
| Mechanical measuring and controlling devices | 382 | 5.6 | 347 | 7.2 | 402 | 7.4 | 225 | 6.8 | 364 | 7.4 | 267 | 7.8 | 221 | 7.3 | 255 | 8.3 | 381 | 9.0 | 448 | 9.0 | 408 | 11.0 | 351 | 9.0 | 332 |
| Mechanical measuring and controlling instruments | 3821 | 5.6 | 264 | 7.0 | 436 | 6.8 | 257 | 6.9 | 495 | 7.5 | 280 | 8.3 | 176 | 7.4 | 125 | 8.7 | 422 | 9.8 | 558 | 8.6 | 370 | 10.2 | 378 | 9.3 | 233 |
| Automatic temperature controls | 3822 | 5.6 | ..... | 7.5 | ..... | 8.5 | ..... | 6.6 | ..... | 7.3 | ..... | 6.9 | ..... | 7.2 | ..... | 7.7 | ..... | 7.6 | ..... | 10.2 | ..... | 12.3 | ..... | 8.6 | 516 |
| Optical instruments and lenses | 383 | 5.6 | ..... | 7.2 | ..... | 6.7 | ..... | 7.8 | ..... | 7.4 | ..... | 5.9 | ..... | 8.6 | ..... | 7.9 | ..... | 10.8 | ..... | 8.5 | ..... | 5.8 | ..... | ..... | ..... |
| Surgical, medical, and dental equipment | 384 | 7.0 | ..... | 7.9 | 423 | 8.5 | 188 | 6.4 | ..... | 7.6 | 424 | 7.4 | 132 | 7.4 | 266 | 9.6 | 630 | 10.1 | 268 | 10.8 | 495 | 9.8 | 315 | 10.7 | 352 |
| Surgical and medical instruments and apparatus | 3841 | 8.1 | ..... | 9.1 | ..... | 8.2 | ..... | 8.8 | ..... | 10.4 | ..... | 10.7 | ..... | 9.3 | ..... | 11.8 | ..... | 11.1 | ..... | 8.7 | ..... | 10.8 | ..... | 8.6 | ..... |
| Surgical appliances and supplies | 3842 | 5.9 | ..... | 7.4 | 585 | 9.2 | ..... | 5.1 | ..... | 5.9 | ..... | 5.2 | ..... | 6.2 | ..... | 7.9 | ..... | 8.5 | ..... | 11.5 | ..... | 7.6 | ..... | 11.0 | ..... |
| Dental equipment and supplies | 3843 | 9.6 | ..... | 7.9 | ..... | 6.3 | ..... | 6.1 | ..... | 7.5 | ..... | 8.0 | ..... | 7.8 | ..... | 10.8 | ..... | 13.1 | ..... | 12.3 | ..... | 15.1 | ..... | 14.0 | ..... |
| Ophthalmic goods | 385 | 3.9 | ..... | 4.1 | ..... | 4.0 | ..... | 4.6 | ..... | 4.9 | ..... | 3.9 | ..... | 4.9 | ..... | 6.1 | ..... | 4.9 | ..... | 5.7 | ..... | 6.3 | ..... | 4.9 | ..... |
| Photographic equipment and supplies | 386 | 5.8 | 330 | 4.8 | 353 | 5.2 | 256 | 4.7 | 327 | 4.7 | 187 | 5.5 | 348 | 5.9 | 250 | 5.7 | 239 | 6.0 | 147 | 6.3 | 418 | 6.4 | 207 | 7.0 | 249 |
| Watches and clocks | 387 | 5.6 | ..... | 5.6 | ..... | 4.8 | ..... | 5.5 | ..... | 5.6 | ..... | 5.1 | ..... | 6.4 | ..... | 8.2 | ..... | ..... | ..... | 8.7 | ..... | 9.1 | 239 | 7.7 | ..... |
| Watches, clocks, and parts except watchcases | 3871 | 4.6 | ..... | 4.7 | ..... | 4.2 | ..... | 5.0 | ..... | 5.3 | ..... | 4.9 | ..... | 6.0 | ..... | 7.4 | ..... | ..... | ..... | 8.6 | ..... | 8.6 | ..... | 7.3 | ..... |
| Miscellaneous manufacturing industries | 39 | 12.0 | 595 | 12.7 | 512 | 12.9 | 699 | 12.3 | 538 | 12.7 | 519 | 13.5 | 513 | 13.3 | 545 | 14.7 | 569 | 15.0 | 632 | 15.3 | 582 | 16.4 | 751 | 15.8 | 561 |
| Jewelry, silverware, and plated ware | 391 | 6.8 | ..... | 7.2 | ..... | 7.3 | ..... | 6.9 | ..... | 6.5 | ..... | 6.8 | ..... | 8.4 | ..... | 8.5 | 335 | 9.3 | 233 | 9.3 | 289 | 9.8 | 459 | 8.6 | 251 |
| Jewelry, precious metal | 3911 | 5.8 | ..... | 5.9 | ..... | 7.1 | ..... | 7.1 | ..... | 5.6 | ..... | 5.2 | ..... | 5.8 | ..... | 6.4 | ..... | 7.4 | ..... | 6.1 | ..... | 8.6 | ..... | 7.2 | ..... |
| Silverware and plated ware | 3914 | 8.0 | ..... | 7.8 | ..... | 7.1 | ..... | 7.3 | ..... | 7.8 | ..... | 9.1 | ..... | 11.5 | ..... | 10.9 | ..... | 10.5 | ..... | 10.9 | ..... | 9.8 | ..... | 11.5 | ..... |
| Musical instruments and parts | 393 | 9.8 | ..... | 12.9 | ..... | 12.0 | ..... | 11.5 | ..... | 12.8 | ..... | 11.9 | ..... | 14.2 | ..... | 15.9 | ..... | ..... | ..... | 17.6 | ..... | 19.5 | ..... | 17.0 | ..... |
| Toys, amusement and sporting goods | 394 | 14.8 | 615 | 14.0 | 352 | 16.2 | 578 | 14.5 | 743 | 14.9 | 546 | 15.9 | 626 | 15.8 | 599 | 18.5 | 766 | 16.4 | 593 | 18.9 | 730 | 20.0 | 824 | 18.6 | 708 |
| Games and toys | 3941 | 13.5 | ..... | 14.4 | 409 | 17.5 | 679 | 15.8 | 769 | 15.5 | 839 | 16.6 | 702 | 15.2 | 815 | 21.1 | 922 | 15.6 | ..... | 19.0 | 893 | 20.4 | 1,019 | 19.7 | 709 |
| Dolls | 3942 | 16.9 | ..... | 13.6 | ..... | 9.1 | ..... | 9.0 | ..... | 13.3 | ..... | 12.3 | ..... | 16.5 | ..... | ..... | ..... | 12.1 | ..... | 14.0 | ..... | 11.0 | ..... | 11.0 | ..... |
| Sporting and athletic goods, n.e.c. | 3949 | 14.9 | ..... | 13.7 | ..... | 16.5 | ..... | 13.2 | ..... | 14.3 | ..... | 15.0 | ..... | 14.6 | ..... | 17.1 | 726 | 18.4 | 499 | 20.7 | 720 | 21.8 | 743 | 19.2 | 586 |
| Pens, pencils, office, and art materials | 395 | 8.5 | ..... | 10.4 | ..... | 11.8 | ..... | 9.4 | ..... | 12.2 | ..... | 10.2 | ..... | 11.8 | ..... | 14.7 | 467 | 13.5 | 756 | 13.8 | 290 | 13.8 | 614 | 15.1 | 449 |
| Pens, mechanical pencils and parts | 3951 | 5.3 | ..... | 5.3 | ..... | 7.4 | ..... | 6.0 | ..... | 6.2 | ..... | 4.0 | ..... | 7.4 | ..... | 5.7 | ..... | ..... | ..... | 7.8 | ..... | ..... | ..... | 9.3 | ..... |
| Lead pencils, crayons, and artists' materials | 3952 | 10.0 | ..... | 18.5 | ..... | 15.8 | ..... | 15.4 | ..... | 19.6 | ..... | 17.2 | ..... | 16.1 | ..... | ..... | ..... | 20.5 | ..... | 24.0 | ..... | 23.8 | ..... | 15.9 | ..... |
| Carbon paper and inked ribbons | 3955 | 13.2 | ..... | ..... | ..... | 17.6 | ..... | 14.4 | ..... | 16.9 | ..... | 17.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 21.7 | ..... | ..... | ..... | ..... | ..... |
| Costume jewelry, buttons, and notions | 396 | 9.1 | ..... | 10.6 | 362 | 10.5 | ..... | 10.1 | ..... | 10.7 | 316 | 12.5 | 288 | 10.5 | 674 | 11.6 | 336 | 12.2 | 648 | 11.1 | 282 | 12.8 | 413 | 13.9 | 528 |
| Buttons | 3963 | 16.5 | ..... | 16.8 | ..... | 16.8 | ..... | 15.0 | ..... | 18.9 | ..... | 21.3 | ..... | 21.9 | ..... | ..... | ..... | ..... | ..... | 15.0 | ..... | 23.4 | ..... | 25.6 | ..... |
| Needles, pins, hooks and eyes, etc. | 3964 | 8.2 | ..... | 10.4 | 515 | 9.6 | ..... | 10.4 | ..... | 11.3 | ..... | 10.9 | 276 | 11.6 | ..... | 11.7 | ..... | 12.1 | ..... | 12.1 | ..... | 11.8 | ..... | 11.9 | ..... |
| Other miscellaneous manufacturing industries | 399 | 13.9 | 747 | 14.9 | 780 | 13.5 | 882 | 14.1 | 502 | 13.9 | 731 | 15.1 | 716 | 13.9 | 674 | ..... | ..... | ..... | ..... | ..... | ..... | 17.3 | 887 | 17.1 | 625 |
| Brooms and brushes | 3991 | 14.5 | ..... | 17.0 | ..... | 16.2 | ..... | 15.5 | ..... | 18.9 | ..... | 17.0 | ..... | 18.3 | ..... | 22.0 | ..... | 16.0 | ..... | 16.8 | ..... | 19.0 | ..... | 18.9 | ..... |
| Signs and advertising displays | 3993 | 13.2 | ..... | 16.6 | ..... | 13.3 | ..... | 15.6 | ..... | 13.9 | ..... | 16.1 | ..... | 14.7 | ..... | 14.2 | ..... | 17.4 | ..... | 17.2 | ..... | 16.4 | ..... | 18.4 | ..... |
| Morticians' goods | 3994 | 17.5 | ..... | 13.0 | ..... | 13.6 | ..... | 13.9 | ..... | 15.4 | ..... | 15.5 | ..... | 15.8 | ..... | 16.2 | ..... | 19.2 | ..... | 21.6 | ..... | 25.2 | ..... | 18.4 | ..... |
| Hard surface floor coverings, n.e.c. | 3996 | 14.4 | 679 | 13.1 | ..... | 9.6 | ..... | 10.3 | ..... | 10.9 | ..... | 8.7 | ..... | 8.9 | ..... | 11.8 | ..... | 11.5 | ..... | 8.4 | ..... | 13.5 | 624 | 14.5 | 1,128 |
| Manufacturing industries, n.e.c. | 3999 | 13.3 | ..... | 13.7 | ..... | 13.8 | ..... | 12.2 | ..... | 10.7 | ..... | 15.1 | ..... | 11.7 | ..... | 12.3 | ..... | 12.2 | ..... | 14.4 | ..... | 15.3 | ..... | 15.3 | ..... |

See footnotes at end of table.

## TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| **Nonmanufacturing** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mining [4] [5] | (1) | | | | | | | | | | | | | | | | | | | | | | | | |
| Coal mining and preparation | | | | 42.5 | 9,170 | 44.0 | 9,384 | 44.1 | 9,476 | 44.2 | 8,942 | 43.9 | 8,253 | 44.7 | 8,704 | 42.9 | 7,539 | 41.9 | 7,538 | 41.6 | 10,289 | 41.2 | 7,153 | 41.6 | 7,792 |
| Bituminous coal | | | | 41.1 | 9,072 | 42.8 | 9,568 | 43.1 | 9,504 | 42.6 | 8,658 | 42.0 | 8,149 | 43.3 | 9,043 | 41.9 | 7,730 | 41.5 | 7,655 | 41.4 | 10,598 | 41.1 | 7,056 | 41.5 | 7,956 |
| Anthracite | | | | 57.1 | 10,198 | 57.0 | 7,489 | 55.9 | 9,170 | 61.5 | 12,062 | 65.5 | 9,432 | 64.0 | 4,808 | 59.4 | 4,356 | 48.7 | 5,368 | 44.9 | 4,068 | 43.4 | 9,327 | 45.4 | 4,005 |
| Metal mining and milling [5] | | | | | | | | 23.6 | 4,147 | 23.7 | 3,114 | 23.9 | 3,525 | 22.5 | 3,331 | 23.3 | 4,103 | 22.8 | 4,073 | 21.4 | 3,286 | 22.0 | 3,457 | 23.7 | 3,238 |
| Copper | | | | | | | | 20.0 | 3,902 | 20.7 | 3,341 | 22.0 | 2,659 | 17.8 | 3,184 | 17.9 | 3,431 | 17.8 | 4,254 | 15.1 | 3,008 | 15.2 | 2,522 | 18.8 | 2,278 |
| Gold-silver | | | | | | | | | | 32.9 | 5,841 | 25.7 | 3,588 | 31.7 | 5,150 | 39.7 | 9,087 | 36.3 | 8,881 | 43.0 | 10,981 | 42.2 | 9,015 | 45.2 | 7,583 |
| Iron | | | | | | | | 12.7 | 2,497 | 11.9 | 2,329 | 12.9 | 2,411 | 13.2 | 1,352 | 13.8 | 2,719 | 13.7 | 2,089 | 12.8 | 1,522 | 13.0 | 1,567 | 15.2 | 2,156 |
| Lead-zinc | | | | | | | | 53.3 | 5,827 | 59.2 | 5,043 | 52.4 | 8,487 | 52.6 | 7,223 | 52.0 | 6,771 | 49.3 | 7,052 | 50.0 | 6,216 | 55.2 | 7,019 | 56.8 | 6,980 |
| Uranium | | | | | | | | 29.6 | 6,620 | 33.2 | 2,998 | 35.0 | 4,875 | 37.1 | 8,218 | 29.3 | 5,828 | 35.1 | 4,625 | 27.5 | 4,072 | 26.8 | 7,195 | 21.4 | 5,014 |
| Miscellaneous metals | | | | | | | | 18.5 | 3,445 | 13.7 | 1,365 | 14.9 | 2,048 | 14.5 | 1,282 | 20.7 | 3,604 | 17.8 | 3,228 | 16.6 | 1,916 | 19.4 | 2,726 | 19.1 | 2,482 |
| Nonmetal mining and milling [5] | | | | | | | | 20.6 | 2,244 | 20.4 | 2,350 | 21.6 | 2,314 | 21.3 | 2,814 | 21.6 | 2,440 | 22.2 | 2,364 | 23.3 | 3,071 | 22.5 | 2,404 | 24.1 | 2,624 |
| Clay-shale | | | | | | | | 23.8 | 1,624 | 25.9 | 937 | 29.1 | 2,792 | 28.0 | 2,386 | 27.7 | 1,972 | 28.1 | 1,987 | 26.4 | 1,497 | 27.2 | 2,540 | 28.5 | 1,946 |
| Gypsum | | | | | | | | 6.5 | 1,023 | 6.1 | 1,433 | 5.5 | 1,078 | 4.9 | 1,782 | 5.5 | 1,996 | 4.0 | 1,047 | 6.8 | 1,243 | 8.0 | 1,368 | 4.6 | 2,358 |
| Phosphate rock | | | | | | | | 11.8 | 3,070 | 9.4 | 2,714 | 11.6 | 2,017 | 14.0 | 5,599 | 16.6 | 3,906 | 17.6 | 3,301 | 20.0 | 1,758 | 9.5 | 2,764 | 5.2 | 2,021 |
| Potash | | | | | | | | 39.2 | 5,784 | 31.9 | 15,901 | 26.1 | 4,739 | 30.8 | 3,247 | 29.2 | 4,161 | 26.2 | 4,482 | 31.3 | 2,483 | 25.5 | 4,741 | 30.5 | 3,286 |
| Salt | | | | | | | | 24.8 | 2,687 | 19.0 | 1,626 | 18.3 | 1,346 | 17.4 | 2,341 | 17.1 | 2,262 | 22.7 | 1,432 | 28.8 | 12,410 | 29.5 | 2,028 | 27.1 | 3,228 |
| Sulphur | | | | | | | | 16.0 | 733 | 14.1 | 1,736 | 12.8 | 414 | 13.0 | 3,022 | 11.6 | 1,975 | 11.9 | 2,869 | 15.1 | 804 | 16.3 | 864 | 11.4 | 270 |
| Miscellaneous nonmetals | | | | | | | | 16.4 | 2,373 | 18.6 | 1,228 | 19.4 | 2,062 | 20.3 | 3,611 | 19.9 | 2,246 | 19.6 | 2,692 | 20.1 | 2,626 | 21.2 | 2,279 | 29.5 | 3,969 |
| Sand and gravel | | 18.6 | 2,478 | 18.8 | 2,250 | 16.8 | 2,160 | 20.1 | 3,867 | 18.6 | 2,907 | 18.5 | 3,030 | 17.9 | 3,613 | 19.1 | 2,771 | 18.8 | 2,723 | 20.2 | 2,498 | 19.4 | 2,820 | 19.5 | 2,651 |
| Stone quarrying and milling [5] | | | | | | | | 16.2 | 2,825 | 17.0 | 2,709 | 17.0 | 2,565 | 16.2 | 2,172 | 17.7 | 2,640 | 16.5 | 2,133 | 16.5 | 2,503 | 17.1 | 2,440 | 18.3 | 2,123 |
| Cement | | | | | | | | 3.9 | 995 | 4.7 | 881 | 5.0 | 945 | 5.4 | 1,295 | 5.7 | 1,153 | 5.8 | 1,053 | 6.4 | 1,451 | 6.0 | 1,325 | 6.5 | 842 |
| Granite | | | | | | | | 25.4 | 4,127 | 25.9 | 6,939 | 26.0 | 3,532 | 21.6 | 2,810 | 23.2 | 2,865 | 23.3 | 2,147 | 22.0 | 2,959 | 24.2 | 3,081 | 24.5 | 2,878 |
| Lime | | | | | | | | 16.5 | 2,260 | 12.5 | 1,596 | 16.0 | 2,062 | 14.7 | 1,668 | 17.9 | 2,991 | 15.1 | 2,218 | 14.1 | 1,944 | 18.0 | 1,804 | 18.8 | 857 |
| Limestone | | | | | | | | 20.6 | 4,075 | 21.9 | 3,644 | 21.3 | 4,136 | 20.4 | 2,954 | 22.8 | 4,028 | 20.7 | 3,057 | 21.0 | 3,266 | 20.9 | 3,515 | 23.2 | 3,082 |
| Marble | | | | | | | | 42.4 | 3,983 | 28.4 | 3,338 | 30.7 | 560 | 34.2 | 3,184 | 32.9 | 2,302 | 29.3 | 1,052 | 28.2 | 2,002 | 29.1 | 4,086 | 26.2 | 1,328 |
| Sandstone | | | | | | | | 22.9 | 3,160 | 28.4 | 2,667 | 27.5 | 2,991 | 24.9 | 2,999 | 27.1 | 2,535 | 22.5 | 582 | 22.8 | 4,081 | 23.3 | 2,059 | 29.7 | 3,414 |
| Slate | | | | | | | | 30.3 | 7,577 | 36.1 | 999 | 27.7 | 2,895 | 30.4 | 689 | 25.8 | 2,645 | 32.7 | 6,346 | 30.2 | 564 | 29.5 | 459 | 19.4 | 5,012 |
| Traprock | | | | | | | | 20.9 | 2,876 | 27.3 | 1,906 | 24.5 | 2,163 | 20.9 | 1,107 | 22.3 | 1,871 | 22.1 | 3,033 | 22.4 | 2,529 | 23.5 | 1,977 | 26.3 | 2,541 |
| Miscellaneous stones | | | | | | | | 20.7 | 2,555 | 26.0 | 8,123 | 22.2 | 1,732 | 19.4 | 1,356 | 23.4 | 2,403 | 19.3 | 2,201 | 18.9 | 3,596 | 23.7 | 1,128 | 21.1 | 2,142 |
| Oil and natural gas | | | | | | | | | | | | | | 9.7 | 934 | 9.2 | 1,050 | 9.4 | 980 | 9.3 | 985 | 9.7 | 983 | 10.4 | 1,281 |
| **Contract Construction** | | 30.9 | 2,496 | 31.5 | 2,643 | 30.9 | 2,139 | 29.5 | 2,497 | 28.6 | 2,219 | 29.5 | 2,434 | 28.3 | 2,585 | 27.9 | 2,203 | 26.7 | 2,130 | 26.9 | 1,992 | 28.0 | 2,154 | 28.0 | 2,100 |
| General building contractors | 15 | 34.0 | 2,610 | 34.9 | 2,317 | 34.9 | 2,036 | 31.5 | 2,157 | 28.8 | 1,756 | 30.5 | 2,026 | 30.1 | 2,194 | 27.8 | 1,782 | 27.6 | 1,486 | 27.0 | 1,616 | 29.0 | 1,701 | 26.5 | 1,749 |
| Other construction, general contractors | 16 | 31.2 | 3,718 | 32.4 | 4,190 | 31.2 | 3,213 | 32.0 | 3,926 | 31.8 | 3,640 | 31.1 | 3,883 | 31.0 | 3,710 | 30.4 | 3,391 | 26.4 | 3,512 | 28.5 | 2,978 | 27.4 | 3,286 | 32.7 | 3,616 |
| Highway and street construction | 161 | 33.7 | 3,103 | 35.0 | 3,355 | 29.8 | 3,385 | 31.5 | 4,109 | 29.7 | 3,107 | 29.5 | 3,373 | 30.6 | 4,105 | 28.5 | 3,486 | 25.4 | 3,706 | 27.4 | 2,734 | 28.3 | 2,681 | 28.9 | 3,807 |
| Other heavy construction | 162 | 28.6 | 4,345 | 29.7 | 5,045 | 32.8 | 3,030 | 32.6 | 3,741 | 34.0 | 4,202 | 32.9 | 4,444 | 31.5 | 3,301 | 32.3 | 3,293 | 27.5 | 3,309 | 29.6 | 3,204 | 26.7 | 3,774 | 35.7 | 3,624 |
| Construction, special trade contractors | 17 | 28.8 | 1,883 | 29.0 | 2,151 | 28.1 | 1,713 | 27.3 | 2,078 | 27.2 | 1,910 | 28.2 | 2,075 | 25.9 | 2,340 | 26.9 | 1,982 | 26.2 | 1,956 | 26.1 | 1,771 | 27.7 | 1,905 | 26.8 | 1,604 |
| Plumbing, heating, and air conditioning | 171 | 27.5 | 1,205 | 28.4 | 1,774 | 27.9 | 952 | 27.1 | 2,493 | 25.4 | 2,063 | 26.1 | 1,253 | 24.4 | 1,524 | 24.4 | 1,259 | 24.9 | 1,298 | 24.4 | 1,459 | 23.7 | 961 | 25.9 | 1,174 |
| Painting, paper hanging, and decorating | 172 | | | | | | | | | 22.3 | | 20.3 | | 15.7 | | 20.4 | 3,763 | 18.3 | 2,291 | 15.6 | | 18.9 | | 19.1 | |
| Electrical work | 173 | 22.7 | 1,211 | 15.6 | 1,060 | 14.6 | 696 | 17.9 | 1,622 | 20.7 | 1,074 | 23.3 | 1,667 | 20.5 | 2,241 | 23.8 | 1,725 | 21.5 | 1,498 | 21.0 | 1,489 | 22.2 | 1,517 | 23.5 | 1,253 |
| Masonry, stonework, tile setting, and plastering | 174 | 32.4 | 743 | 36.1 | 1,884 | 33.3 | 1,566 | 29.3 | 921 | 31.0 | 1,175 | 31.6 | 1,912 | 26.5 | 1,975 | 28.4 | 1,824 | 27.9 | 1,285 | 27.8 | 1,603 | 30.2 | 1,739 | 30.8 | 1,403 |
| Carpentering and wood flooring | 175 | | | | | | | | | | | 29.4 | | 28.6 | | 31.1 | 1,148 | 27.9 | 1,447 | 27.2 | 1,607 | 32.9 | 859 | 23.8 | |
| Roofing and sheet metal work | 176 | 48.8 | 2,198 | 40.8 | 2,517 | 44.6 | 1,559 | 45.5 | 3,786 | 43.9 | 3,107 | 43.7 | 3,681 | 45.9 | 3,140 | 42.2 | 2,707 | 44.1 | 3,378 | 43.9 | 2,750 | 45.3 | 1,818 | 43.0 | 2,218 |
| Concrete work | 177 | | | | | | | | | | | | | | | 28.0 | 1,774 | | | | | | | 27.8 | |
| Miscellaneous special trade contractors | 179 | 25.9 | 3,422 | 29.7 | 2,974 | 28.6 | 4,044 | 26.6 | 3,593 | 26.9 | 2,848 | 26.6 | 1,893 | 25.9 | 3,501 | 26.4 | 2,484 | 25.2 | 2,956 | 26.5 | 2,345 | 29.8 | 3,732 | 25.6 | 2,604 |

See footnotes at end of table,

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| **Transportation and public utilities** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Local and interurban passenger transit | 41 | 13.3 | 604 | 14.3 | 958 | 16.1 | 1,159 | 15.7 | 560 | 12.3 | 1,162 | 14.8 | 694 | 15.8 | 898 | 23.5 | 884 | 23.9 | 1,239 | 23.6 | 1,220 | 18.4 | 997 | 23.9 | 1,000 |
| Local and suburban passenger transportation | 411 | 12.7 | 732 | 13.5 | 692 | 15.4 | 851 | 13.7 | 507 | 13.5 | 1,221 | 15.7 | 1,072 | 16.1 | 1,123 | 16.0 | 915 | 18.5 | 885 | 23.3 | 1,069 | 20.2 | 904 | 19.9 | 1,230 |
| Taxicabs | 412 | | | 13.8 | | | | | | | | | | 18.3 | | | | | | | | | | | |
| Intercity and rural bus lines | 413 | 18.2 | | 18.4 | | 17.8 | | 15.8 | | 14.7 | | 15.3 | | 14.7 | | 12.4 | | 16.8 | | 13.6 | | 17.1 | | | |
| School buses | 415 | | | | | | | | | | | | | | | | | 4.0 | | | | 6.5 | | 3.4 | |
| Motor freight transportation and warehousing | 42 | 28.9 | 1,732 | 32.3 | 1,924 | 31.8 | 2,220 | 30.2 | 1,574 | 31.3 | 1,998 | 31.2 | 1,950 | 29.2 | 1,672 | 31.5 | 2,120 | 31.7 | 1,877 | 31.7 | 1,821 | 36.4 | 2,238 | 35.3 | 2,311 |
| Trucking, local and long distance | 421 | 29.2 | 1,666 | 32.9 | 1,974 | 32.6 | 2,292 | 30.6 | 1,446 | 32.0 | 2,030 | 31.7 | 2,001 | 29.7 | 1,727 | 31.7 | 2,195 | 32.4 | 1,941 | 32.1 | 1,890 | | | 35.6 | 2,335 |
| Public warehousing | 422 | 26.6 | 1,772 | 28.8 | 1,614 | 25.4 | 1,685 | 25.8 | 2,282 | 25.4 | 1,829 | 25.3 | 1,550 | 26.0 | 1,235 | 28.5 | 1,107 | 24.1 | 1,225 | 28.3 | 1,121 | 28.9 | 721 | 31.1 | 2,069 |
| Water transportation | 44 | | | | | | | | | | | | | | | | | | | | | | | | |
| Marine cargo handling | 4463 | | | | | | | | | 80.5 | 5,801 | 76.6 | 6,053 | 68.8 | 5,296 | 64.2 | 4,624 | 63.9 | 5,005 | | | | | | |
| Communication | 48 | .9 | 88 | 1.0 | 101 | .9 | 78 | .9 | 82 | .9 | 105 | 1.0 | 142 | 1.0 | 126 | 1.2 | 116 | 1.3 | 83 | 1.9 | 194 | 2.0 | 132 | 2.5 | 235 |
| Telephone communication (wire or radio) | 481 | .7 | 85 | .8 | 104 | .9 | 72 | .8 | 77 | .9 | 94 | .9 | 141 | .9 | 129 | 1.1 | 115 | 1.2 | 82 | 1.8 | 184 | 1.9 | 129 | 2.5 | 226 |
| Radio broadcasting and television | 483 | 4.5 | | 3.2 | | 2.0 | | 2.2 | | 2.3 | | 2.3 | | 2.6 | | 3.2 | | 3.3 | | 3.3 | 338 | 3.6 | | 4.1 | |
| Electric, gas, and sanitary services | 49 | 6.3 | 977 | 6.2 | 920 | 5.7 | 902 | 5.7 | 840 | 5.7 | 887 | 5.7 | 832 | 5.3 | 777 | 5.5 | 873 | 5.6 | 740 | 6.2 | 966 | 6.3 | 882 | 6.6 | 813 |
| Electric companies and systems | 491 | 5.5 | 1,278 | 5.0 | 1,236 | 5.0 | 1,211 | 5.4 | 1,251 | 5.0 | 872 | 5.2 | 1,012 | 5.1 | 1,128 | 5.3 | 1,039 | 4.7 | 1,058 | 5.8 | 1,078 | 5.7 | 1,307 | 6.1 | 966 |
| Gas companies and systems | 492 | 8.1 | 683 | 7.5 | 437 | 7.0 | 590 | 7.0 | 536 | 6.8 | 678 | 6.6 | 503 | 6.3 | 436 | 6.8 | 637 | 6.7 | 410 | 7.0 | 751 | 6.7 | 514 | 7.5 | 534 |
| Natural gas transmission | 4922 | | | 5.7 | 337 | 5.9 | 1,090 | 5.6 | 643 | 5.2 | 1,133 | 5.1 | 655 | 4.4 | 482 | | | | | | | | | | |
| Natural gas transmission and distribution | 4923 | 6.5 | | 5.8 | 467 | 5.7 | 470 | 6.1 | 226 | 6.0 | 462 | 5.8 | 657 | 5.6 | 459 | | | | | | | | | | |
| Natural gas distribution | 4924 | 10.2 | 635 | 10.0 | 386 | 9.1 | 451 | 9.3 | 715 | 9.0 | 672 | 8.6 | 232 | 8.3 | 455 | | | | | | | | | | |
| Mixed, manufactured or L. P. gas production and/or distribution | 4925 | 5.7 | | 6.6 | 580 | 6.1 | 244 | 5.6 | 595 | 5.6 | 278 | 6.3 | 487 | 5.4 | 198 | | | | | | | | | | |
| Combination companies and systems | 493 | 5.4 | 770 | 5.3 | 1,003 | 4.8 | 839 | 4.3 | 693 | 5.0 | 1,008 | 4.9 | 913 | 4.1 | 729 | 4.0 | 886 | 4.6 | 775 | 4.8 | 937 | 5.4 | 756 | 5.3 | 822 |
| Electric operations of combination companies | 493P | 4.8 | | 5.2 | 1,041 | 4.6 | 1,035 | 4.4 | 823 | 5.0 | 1,328 | 5.1 | 1,163 | 4.4 | 978 | | | | | | | | | | |
| Gas operations of combination companies | 493P | 6.5 | | 5.5 | 915 | 5.2 | 222 | 4.2 | 365 | 4.5 | 176 | 3.5 | 225 | 3.3 | 237 | | | | | | | | | | |
| Water supply companies | 494 | 24.2 | | 23.2 | | 19.2 | | 18.3 | | 16.9 | | 15.5 | | 17.3 | | 17.9 | | | | 22.9 | | | | | |
| **Wholesale and retail trade** | | | | | | 13.0 | 553 | 11.6 | 488 | 12.2 | 515 | 11.8 | 488 | 11.8 | 494 | 11.9 | 460 | 11.2 | 467 | 11.3 | 469 | 11.6 | 438 | | |
| Wholesale trade | 50 | 14.2 | 769 | 15.3 | 818 | 15.1 | 784 | 14.3 | 652 | 13.5 | 709 | 13.6 | 802 | 13.9 | 804 | 14.4 | 730 | 13.7 | 701 | 13.8 | 671 | 14.3 | 588 | 13.1 | 639 |
| Motor vehicles and automotive equipment | 501 | 4.7 | | 6.6 | | 6.3 | | 6.3 | | 7.0 | | 6.9 | | 8.8 | 419 | 9.1 | 360 | 8.9 | 316 | 8.5 | 300 | 7.4 | 177 | 8.4 | 407 |
| Drugs, chemicals, and allied products | 502 | 7.3 | | 9.7 | | 7.8 | | 11.2 | | 8.8 | | 10.6 | | 9.3 | | 9.1 | | 11.4 | | 9.4 | | 10.0 | | 11.1 | |
| Dry goods and apparel | 503 | | | | | | | | | | | | | 2.3 | | | | | | 5.0 | | | | | |
| Groceries and related products | 504 | 22.8 | 790 | 23.2 | 1,348 | 22.8 | 1,082 | 21.6 | 865 | 19.2 | 477 | 18.5 | 635 | 20.6 | 1,382 | 21.3 | 709 | 23.3 | 844 | 22.4 | 1,120 | 23.1 | 737 | 23.0 | 735 |
| Farm products—raw material | 505 | | | | | | | | | | | | | | | | | 15.3 | | 11.6 | | 15.6 | | | |
| Electrical goods | 506 | 5.6 | | 5.5 | | 6.8 | | 6.0 | | 5.7 | | 4.8 | | 4.6 | | 5.0 | | 5.7 | | 5.3 | | 8.3 | | 7.5 | |
| Hardware, plumbing, heating equipment, and supplies | 507 | 12.6 | | 12.7 | | 12.0 | | 10.7 | | 12.9 | | 11.6 | | 10.1 | | 12.1 | | 9.4 | | 12.6 | | 13.2 | | 12.6 | |
| Machinery, equipment, and supplies | 508 | 11.3 | | 13.8 | 750 | 13.3 | 593 | 11.7 | 581 | 9.0 | 436 | 10.1 | 704 | 12.1 | 462 | 9.4 | 482 | 8.3 | 671 | 9.9 | 393 | 10.7 | 386 | 9.5 | 540 |
| Miscellaneous wholesalers | 509 | 16.9 | 1,054 | 18.0 | 850 | 18.3 | 1,199 | 17.6 | 809 | 18.0 | 1,248 | 18.1 | 1,005 | 17.8 | 1,023 | 19.4 | 1,147 | 17.4 | 1,000 | 17.6 | 821 | 17.6 | 949 | 14.6 | 955 |
| Retail building materials, and farm equipment | 52 | 19.8 | 1,083 | 21.2 | 1,199 | 20.2 | 943 | 17.2 | 804 | 19.0 | 1,469 | 18.3 | 818 | 19.0 | 1,012 | 18.4 | 668 | 19.9 | 1,126 | 19.3 | 1,080 | 18.7 | 922 | 18.8 | 923 |
| Lumber and other building materials dealers | 521 | 23.0 | 1,203 | 23.9 | 1,167 | 22.8 | 1,066 | 20.7 | 1,114 | 22.0 | 1,313 | 21.4 | 1,346 | 22.0 | 1,386 | 21.7 | 840 | 26.1 | 1,462 | 24.4 | 1,485 | 22.9 | 939 | 24.1 | 966 |
| Hardware and farm equipment | 525 | | | | | | | | | | | | | | | 15.4 | | 15.8 | | 16.6 | | 16.2 | | 15.3 | |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| Retail general merchandise | 53 | 6.7 | 217 | 6.8 | 272 | 7.1 | 195 | 7.1 | 162 | 7.3 | 151 | 8.1 | 258 | 7.8 | 181 | 8.6 | 271 | 7.8 | 330 | 9.0 | 281 | 8.4 | 316 | 8.0 | 205 |
| Department stores | 531 | 7.7 | 216 | 7.9 | 322 | 7.8 | 236 | 8.2 | 199 | 8.6 | 197 | 8.6 | 270 | 8.5 | 220 | 9.5 | 266 | 9.5 | 355 | 10.5 | 264 | 9.7 | 178 | 8.7 | 234 |
| Mail order houses | 532 | | | 6.9 | | 7.2 | | 5.1 | | 6.1 | | | | 6.1 | | 5.4 | | 7.2 | | 6.8 | | 10.5 | | 10.6 | |
| Limited price variety stores | 533 | 5.0 | | 3.6 | | 3.9 | | 5.6 | | 5.0 | | 7.5 | | 7.6 | | 6.5 | | 3.3 | | 5.4 | | 3.8 | | 5.3 | |
| Miscellaneous general merchandise stores | 539 | 5.8 | | 6.6 | | 9.6 | | 5.0 | | 5.7 | | 5.9 | | 5.5 | | 7.0 | | 5.9 | | 5.2 | | 5.8 | | 6.1 | |
| Retail food | 54 | 15.1 | 290 | 16.5 | 342 | 16.5 | 281 | 13.3 | 482 | 19.1 | 341 | 13.9 | 406 | 15.5 | 324 | 12.6 | 322 | 13.5 | 253 | 13.1 | 353 | 13.3 | 366 | 16.4 | 407 |
| Grocery stores | 541 | 16.6 | 285 | 17.9 | 365 | 17.8 | 274 | 14.1 | 401 | 20.6 | 355 | 14.4 | 398 | 15.4 | 340 | 13.1 | 356 | 14.5 | 200 | 14.1 | 386 | 13.6 | 378 | 17.4 | 369 |
| Retail bakeries | 546 | | | | | | | | | | | | | | | | | 4.5 | | 6.5 | 246 | 7.9 | | 7.3 | |
| Automotive dealers and service stations | 55 | 15.3 | 521 | 15.0 | 502 | 14.9 | 765 | 12.7 | 558 | 13.6 | 486 | 13.9 | 428 | 12.7 | 535 | 11.9 | 526 | 12.4 | 563 | 12.8 | 537 | 13.2 | 504 | 13.3 | 460 |
| Motor vehicle dealers (new and used cars) | 551 | 13.9 | 427 | 15.6 | 532 | 16.2 | 698 | 14.2 | 441 | 14.2 | 331 | 15.3 | 435 | 13.3 | 379 | 11.8 | 491 | 13.0 | 462 | 12.9 | 458 | 13.0 | 334 | 13.4 | 389 |
| Tire, battery, and accessory dealers | 553 | | | | | | | | | | | | | | | | | 15.8 | | 14.1 | | 23.3 | 768 | 22.0 | 418 |
| Gasoline service stations | 554 | 16.1 | | 12.4 | | 12.4 | | 9.8 | | 11.3 | | 11.7 | | 11.1 | | 11.1 | | 11.1 | | 12.3 | | 10.3 | | 11.0 | |
| Retail apparel and accessories | 56 | 3.4 | | 4.8 | | 5.0 | | 3.9 | | 5.1 | | 3.6 | 176 | 3.6 | | 4.9 | | 3.2 | 86 | 2.7 | 204 | 2.8 | 61 | 2.6 | |
| Men's and boys' clothing and furnishings stores | 561 | | | | | | | | | | | | | | | | | 5.1 | | 1.8 | | 3.4 | | 3.3 | |
| Women's ready-to-wear stores | 562 | 3.2 | | 4.4 | | 5.2 | | 3.8 | | 5.6 | | 4.0 | | 4.3 | | 6.3 | | 3.6 | | 3.1 | | 2.7 | | 2.9 | |
| Retail furniture and home furnishings | 57 | 10.2 | 196 | 13.2 | | 13.4 | | 11.5 | | 10.9 | | 11.2 | | 10.5 | | 10.4 | | 10.5 | 619 | 10.4 | 413 | 10.9 | 596 | 9.6 | 481 |
| Furniture, home furnishings, and equipment stores | 571 | 10.2 | | 12.9 | | 14.2 | | 11.9 | | 12.1 | | 11.7 | | 12.0 | | 10.6 | | 11.3 | | 11.2 | | 12.7 | 510 | 10.8 | |
| Eating and drinking places | 58 | 11.0 | 231 | 11.6 | 279 | 12.1 | 443 | 11.1 | 418 | 9.8 | 408 | 10.9 | 351 | 10.4 | 277 | 11.6 | 279 | 9.0 | 196 | 9.2 | 178 | 9.7 | 225 | 8.9 | 297 |
| Miscellaneous retail stores | 59 | 10.3 | 524 | 9.8 | 383 | 9.2 | 617 | 7.9 | 295 | 9.3 | 530 | 9.3 | 306 | 9.0 | 417 | 9.4 | 394 | 8.4 | 333 | 7.5 | 443 | 8.2 | 426 | 7.4 | 487 |
| Drug stores and proprietary stores | 591 | 6.4 | | 3.9 | | 4.5 | | 3.2 | | 6.5 | | 7.2 | | 6.5 | | 6.9 | | 6.7 | | 2.6 | | 4.2 | | 1.5 | |
| Farm and garden supply stores | 596 | | | | | | | | | | | | | | | | | 18.8 | | 18.9 | | 16.4 | | 18.5 | |
| Fuel and ice dealers | 598 | 26.6 | | 28.0 | | 22.9 | | 20.8 | | 23.3 | | 17.4 | | 19.3 | | 18.3 | | 17.7 | | 20.1 | 715 | 19.9 | | 22.4 | 575 |
| Retail stores, n.e.c. | 599 | 4.7 | | | | | | | | | | | | 6.6 | | 8.3 | | 6.3 | | 5.1 | | 5.2 | | 5.1 | |
| **Finance, insurance, and real estate** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Banking | 60 | 2.3 | | 2.4 | | 2.4 | 73 | 2.1 | | 2.3 | | 2.4 | | 2.2 | 72 | 2.4 | 102 | 2.2 | 206 | 2.0 | 130 | 2.1 | 163 | 2.4 | 88 |
| Credit agencies other than banks | 61 | 2.3 | | 2.5 | | 2.3 | | 1.5 | | .7 | | 1.6 | | 1.6 | | 1.4 | | .9 | | .9 | | 1.0 | | .9 | |
| Security and commodity brokers, and services | 62 | .8 | | 1.0 | | 1.6 | | 1.3 | | 1.2 | | .5 | | 1.2 | | .9 | | .6 | | .9 | | .7 | | .4 | |
| Insurance carriers | 63 | 2.2 | | 2.4 | 235 | 2.3 | 178 | 2.0 | 95 | 2.2 | 169 | 2.2 | 179 | 2.3 | 162 | 2.4 | 238 | 2.0 | 101 | 2.4 | 186 | 2.1 | 93 | 2.6 | 137 |
| Insurance agents, brokers, and service | 64 | 1.4 | | | | 2.7 | | 2.1 | | 2.0 | | 2.3 | | 1.5 | | 1.4 | | 1.9 | | 1.3 | | 1.4 | | .9 | |
| Real estate | 65 | 12.0 | | 13.6 | | 14.7 | | 13.6 | | 12.7 | | 10.9 | | 10.4 | | 9.5 | | 10.2 | | 10.7 | 703 | 10.3 | 468 | 11.4 | 341 |

See footnotes at end of table.

TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| **Services** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hotels and other lodging places | 70 | 11.9 | 479 | 13.5 | 623 | 13.3 | 585 | 12.5 | 246 | 13.5 | 427 | 13.5 | 459 | 12.5 | 451 | 13.0 | 529 | 13.2 | 270 | 12.7 | 524 | 11.4 | 568 | 11.5 | 397 |
| Hotels, tourist courts, and motels | 701 | 11.9 | 480 | 13.6 | 623 | 13.3 | 592 | 12.5 | 245 | 13.5 | 428 | 13.3 | 462 | 12.5 | 354 | 13.1 | 538 | 12.8 | 273 | 12.7 | 535 | 10.9 | 590 | 11.7 | 369 |
| Personal services | 72 | 8.3 | 475 | 7.9 | 553 | 8.0 | 554 | 8.3 | 283 | 8.4 | 475 | 8.9 | 462 | 9.3 | 362 | 9.5 | 412 | 8.9 | 502 | 8.6 | 323 | 9.8 | 453 | 7.8 | 276 |
| Laundries and cleaning and dyeing plants | 721 | 8.3 | 485 | 8.2 | 548 | 8.4 | 562 | 8.7 | 298 | 9.0 | 505 | 9.5 | 430 | 9.9 | 399 | 10.6 | 456 | 10.2 | 578 | 10.1 | 369 | 11.6 | 543 | 9.6 | 343 |
| Beauty shops | 723 | | | | | | | | | | | | | | | | | 1.1 | | 1.1 | | 1.3 | | .9 | |
| Miscellaneous business services | 73 | 8.8 | 563 | 10.5 | 535 | 9.9 | 649 | 6.6 | 528 | 7.2 | 308 | 7.5 | 630 | 7.5 | 671 | 6.9 | 470 | 7.4 | 434 | 5.4 | 320 | 6.5 | 442 | 6.0 | 310 |
| Services to dwellings and other buildings | 734 | | | | | | | | | | | 14.2 | | 14.1 | | 10.1 | | 14.0 | | 9.4 | | 10.9 | | 10.0 | |
| Business services, n.e.c | 739 | 4.9 | | 5.9 | | 6.8 | 717 | 4.8 | | 5.0 | | 6.1 | 629 | 5.2 | | 6.1 | 313 | 6.3 | 412 | 4.8 | 243 | 5.6 | 162 | 4.7 | 230 |
| Automobile repair, services, and garages | 75 | 16.9 | 1,005 | 15.3 | | 15.6 | | 13.7 | | 13.2 | | 14.1 | | 13.9 | | 14.2 | 829 | 16.0 | 1,050 | 14.5 | 568 | 15.9 | 852 | 14.3 | 427 |
| Automobile repair shops | 753 | 19.2 | | 17.7 | | 19.3 | | 15.7 | | 16.1 | | 16.3 | | 16.1 | | 18.0 | | 19.4 | | 17.2 | | 20.2 | 805 | 18.2 | 665 |
| Miscellaneous repair services | 76 | 18.5 | | 18.4 | | 18.5 | | 19.0 | | 18.2 | | 20.2 | | 16.7 | | 15.6 | | 19.9 | 1,189 | 20.1 | 710 | 15.1 | | 15.4 | 633 |
| Miscellaneous repair shops and related services | 769 | | | | | | | | | | | | | | | 21.3 | | 25.8 | | 26.5 | | 22.1 | | 19.2 | |
| Motion pictures | 78 | 4.6 | | 6.9 | | 7.4 | | 5.7 | | 5.9 | | 5.5 | | 5.6 | | 4.3 | | 6.9 | | 5.9 | | 6.0 | | 4.6 | |
| Motion picture service industries | 782 | | | 6.9 | | 11.7 | | 9.9 | | 7.9 | | 8.8 | | 12.2 | | 6.9 | | 8.1 | | 11.2 | | | | | |
| Amusement and recreation, except motion pictures | 79 | 13.5 | | 13.6 | | 16.3 | | 14.2 | | 14.4 | | 14.4 | | 13.2 | | 16.2 | | 14.0 | | 10.5 | 562 | 10.4 | 367 | 9.5 | 415 |
| Other amusement and recreation services | 794 | 14.4 | | 15.0 | | 18.0 | | 15.3 | | 15.8 | | 15.3 | | 13.9 | | 17.5 | | 16.8 | | 12.2 | | 11.0 | | 10.9 | 496 |
| Medical and other health services | 80 | 8.1 | 264 | 8.1 | 234 | 8.4 | 221 | 8.0 | 232 | 7.4 | 242 | 8.6 | 236 | 7.8 | 247 | 7.5 | 260 | 8.9 | 264 | 8.3 | 262 | 9.5 | 284 | 9.3 | 264 |
| Offices of physicians and surgeons | 801 | | | | | | | | | | | | | | | | | 1.1 | | .6 | | 2.0 | | .8 | |
| Hospitals | 806 | 8.1 | 266 | 8.2 | 236 | 8.6 | 221 | 8.2 | 239 | 7.5 | 241 | 8.9 | 248 | 8.1 | 244 | 7.8 | 268 | 9.2 | 279 | 8.7 | 284 | 9.9 | 282 | 10.0 | 262 |
| Health and allied services, n.e.c | 809 | | | | | 6.5 | | 5.5 | | 8.3 | | 7.7 | | 6.8 | | 6.9 | | 8.8 | | 8.7 | 201 | 10.1 | 258 | 9.3 | 401 |
| Legal services | 81 | | | | | | | | | | | | | | | | | .9 | | 1.1 | | .8 | | .7 | |
| Educational services | 82 | 8.9 | 529 | 8.5 | 222 | 7.9 | 344 | 8.2 | 337 | 7.4 | 320 | 7.5 | 377 | 8.3 | 323 | 8.0 | 236 | 7.6 | 334 | 7.3 | 245 | 7.3 | 326 | 6.7 | 385 |
| Elementary and secondary schools | 821 | | | | | | | | | | | | | 9.6 | | 8.3 | | 6.3 | | 7.8 | | 7.5 | | 7.1 | |
| Colleges, universities, and professional schools | 822 | 7.6 | 303 | 7.9 | 264 | 8.2 | 466 | 7.6 | 238 | 8.0 | 389 | 7.7 | 281 | 8.3 | 391 | 8.2 | 224 | 8.5 | 420 | 7.3 | 269 | 7.4 | 255 | 7.1 | 287 |
| Nonprofit membership organizations | 86 | | | | | | | | | | | 6.4 | | 5.6 | | 4.0 | | 8.3 | | 6.4 | | 6.6 | | 6.6 | 461 |
| Miscellaneous services | 89 | 6.5 | | 5.2 | | 6.2 | | 4.1 | | 4.1 | | 4.0 | | 2.8 | | 3.7 | | 3.8 | | 3.9 | | 4.0 | | 3.2 | 148 |
| Engineering and architectural services | 891 | 6.0 | | 6.5 | | 6.8 | | 5.4 | | 5.3 | | 5.4 | | 3.7 | | 4.8 | | 5.1 | | 4.3 | | 4.7 | | 4.9 | |
| Accounting, auditing, and bookkeeping services | 893 | | | | | | | | | | | | | | | | | .8 | | .8 | | 1.2 | | .8 | |

See footnotes at end of table.

## TABLE B–1.—*Work-Injury Rates, by Industry, 1958–70* [1]—Continued

| Industry [2] | SIC code [3] | 1958 | | 1960 | | 1961 | | 1962 | | 1963 | | 1964 | | 1965 | | 1966 | | 1967 | | 1968 | | 1969 | | 1970 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | | Rate | |
| | | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity | Frequency | Severity |
| **Government** | | | | | | | | | | | | | | | | | | | | | | | | | |
| State government | 92 | | | | | | | | | | | | | | | | | | | | | | | | |
| Hospitals | 9280P | 17.7 | 762 | 16.3 | 757 | 19.9 | 719 | 21.1 | 627 | 17.7 | 671 | 20.0 | 744 | 21.0 | 555 | 19.0 | 738 | 19.6 | 732 | 20.0 | 535 | 16.0 | 401 | 21.4 | 636 |
| Institutions of higher education | 9282P | 7.6 | 440 | 9.3 | 237 | 9.1 | 444 | 8.2 | 448 | 8.3 | 225 | 7.8 | 335 | 8.7 | 308 | 8.5 | 235 | 7.0 | 184 | 7.1 | 286 | 6.2 | 218 | 7.4 | 308 |
| Correctional institutions | 9290P | | | | | | | | | | | | | | | | | 19.9 | | | | | | | |
| Highways | 9290P | | | | | | | | | | | | | | | | | 8.3 | 851 | 8.0 | 790 | 5.1 | | | |
| Local government | 93 | | | | | | | | | | | | | | | | | | | | | | | | |
| Transit systems | 9341P | 15.0 | 908 | 14.4 | 1,114 | 16.5 | 1,126 | 16.1 | 927 | 16.9 | 1,337 | 17.2 | 992 | 18.3 | 1,395 | 17.1 | 848 | 14.7 | 921 | 16.0 | 670 | | | 22.0 | 853 |
| Electric systems | 9349P | 17.5 | 1,341 | 17.3 | 1,669 | 19.4 | 1,794 | 17.2 | 1,307 | 17.1 | 2,229 | 19.8 | 2,101 | 16.6 | 1,546 | 17.0 | 1,528 | 17.2 | 1,449 | 18.3 | 1,087 | 17.8 | 1,622 | 17.2 | 1,391 |
| Gas systems | 9349P | | | | | 9.4 | | 9.0 | | 7.6 | 1,162 | 7.4 | | 11.9 | | 7.9 | | 5.7 | | 7.5 | | 11.0 | | 14.1 | |
| Water supply systems | 9349P | 20.9 | 1,438 | 20.5 | 1,184 | 20.6 | 1,191 | 19.5 | 647 | 21.6 | 857 | 20.9 | 791 | 20.2 | 488 | 22.8 | 719 | 21.3 | 1,137 | 23.6 | 1,123 | 20.1 | 936 | 24.9 | 1,583 |
| Sewers and sewage disposal | 9349P | 26.2 | | 30.2 | | 30.8 | | 29.8 | | 26.0 | | 29.8 | | 31.9 | | | | | | | | | | | |
| Refuse collection and disposal and other sanitary services | 9349P | 47.7 | 1,704 | 46.7 | 1,950 | 52.5 | 1,900 | 49.6 | 3,880 | 49.1 | 2,082 | 51.5 | 1,938 | 53.8 | 2,363 | 70.0 | 2,222 | 52.4 | 2,374 | 49.8 | 2,438 | 48.3 | 1,496 | 63.9 | 2,598 |
| Other local utilities (combination utilities and other transportation, communication and unspecified utilities) | 934P | 23.2 | 1,591 | 23.2 | 1,438 | 26.8 | 1,558 | 28.3 | 1,431 | 24.8 | 2,065 | 27.3 | 882 | 28.1 | 677 | 26.7 | | 25.2 | | | | | | 23.0 | |
| Hospitals | 9380P | 9.7 | 381 | 11.8 | 354 | 11.7 | 313 | 10.7 | 463 | 9.4 | 609 | 9.6 | 300 | 12.1 | 344 | 9.3 | 235 | 10.5 | 431 | 11.7 | 374 | 12.2 | 415 | 13.0 | 400 |
| Elementary and secondary schools | 9382P | 8.2 | 502 | 8.3 | 220 | 7.8 | 238 | 8.4 | 317 | 9.1 | 242 | 8.9 | 313 | 8.4 | 224 | 8.6 | 197 | 5.9 | 191 | 8.0 | 182 | 7.5 | 212 | 9.3 | 300 |
| Police | 9390P | 33.1 | 2,116 | 34.1 | 2,503 | 36.3 | 2,314 | 30.3 | 2,006 | 33.7 | 2,020 | 39.1 | 2,767 | 43.1 | 2,184 | 44.8 | 2,805 | 37.3 | 4,328 | 36.5 | 2,722 | 42.3 | 3,762 | 45.6 | 2,521 |
| Fire protection | 9390P | 31.8 | 2,003 | 33.4 | 2,993 | 36.7 | 3,004 | 35.7 | 2,501 | 35.3 | 3,848 | 29.3 | 3,218 | 31.4 | 2,745 | 31.0 | 2,418 | 40.4 | 2,983 | 43.8 | 3,287 | 48.8 | 3,856 | 41.7 | 4,349 |
| Institutions of higher education | 9382P | | | | | | | | | | | | | | | | | 6.2 | | | | 6.3 | | | |
| Federal Government [4] | (5) | 8.1 | 501 | 8.4 | 594 | 8.0 | 539 | 7.9 | 458 | 7.9 | 522 | 7.7 | 516 | 7.3 | 531 | 6.9 | 534 | 7.1 | 553 | 6.9 | 628 | 6.7 | 630 | 6.6 | 554 |
| Department of State | | 2.1 | 237 | 2.0 | 341 | 1.7 | 377 | 2.5 | 593 | 2.6 | 724 | 2.5 | 753 | 2.6 | 1,157 | 2.2 | 1,112 | 2.2 | 1,341 | 2.6 | 1,972 | 2.2 | | 1.7 | |
| Department of Treasury | | 4.3 | 249 | 3.9 | 229 | 3.5 | 277 | 3.6 | 241 | 3.7 | 295 | 4.5 | 387 | 4.5 | 388 | 4.1 | 253 | 3.3 | 285 | 3.2 | 266 | 3.7 | | 3.0 | |
| Department of Army | | 4.8 | 493 | 4.6 | 419 | 4.4 | 413 | 4.7 | 407 | 4.9 | 471 | 4.4 | 449 | 4.2 | 476 | 4.1 | 483 | 4.0 | 554 | 3.9 | 704 | 3.6 | | 3.4 | |
| Department of Navy | | 3.9 | 553 | 4.5 | 1,055 | 4.2 | 677 | 4.0 | 474 | 4.0 | 686 | 4.6 | 649 | 4.9 | 656 | 4.1 | 568 | 3.9 | 634 | 4.2 | 859 | 3.7 | | 3.8 | |
| Department of Air Force | | 7.0 | 543 | 6.8 | 464 | 7.0 | 460 | 6.4 | 444 | 6.3 | 480 | 5.9 | 502 | 5.7 | 650 | 5.6 | 475 | 5.6 | 605 | 5.3 | 672 | 5.0 | | 4.7 | |
| Post Office Department | | 16.7 | 449 | 20.1 | 647 | 19.2 | 646 | 19.3 | 581 | 18.9 | 642 | 17.7 | 605 | 16.8 | 580 | 14.4 | 545 | 15.4 | 598 | 15.3 | 614 | 15.0 | | 14.1 | |
| Department of Justice | | 4.3 | 112 | 4.6 | 625 | 4.4 | 474 | 4.5 | 286 | 4.7 | 413 | 4.3 | 226 | 4.1 | 423 | 4.1 | 295 | 5.1 | 692 | 4.9 | 790 | 4.5 | | 4.0 | |
| Department of the Interior | | 11.6 | 911 | 10.9 | 1,533 | 10.0 | 1,124 | 9.1 | 937 | 11.2 | 1,094 | 9.2 | 1,210 | 8.2 | 947 | 7.5 | 1,085 | 7.9 | 868 | 7.4 | 796 | 7.6 | | 7.6 | |
| Department of Agriculture | | 7.4 | 832 | 12.0 | 1,290 | 11.9 | 1,633 | 9.4 | 1,010 | 9.4 | 707 | 8.3 | 742 | 7.4 | 615 | 7.5 | 1,048 | 8.6 | 837 | 7.0 | 689 | 6.9 | | 8.2 | |
| Department of Commerce | | 5.2 | 483 | 7.8 | 967 | 5.8 | 439 | 5.0 | 292 | 5.2 | 633 | 5.2 | 503 | 4.7 | 646 | 4.7 | 486 | 4.5 | 253 | 3.4 | 519 | 3.4 | | 6.7 | |
| Department of Labor | | 3.3 | 37 | 3.3 | 102 | 3.7 | 760 | 3.5 | 108 | 2.9 | 85 | 2.8 | 85 | 2.0 | 488 | 2.3 | 675 | 1.7 | 323 | 2.3 | 712 | 2.5 | | 2.1 | |
| Department of Health, Education, and Welfare | | 4.7 | 295 | 4.7 | 196 | 4.2 | 168 | 4.6 | 190 | 4.8 | 313 | 5.1 | 181 | 4.2 | 171 | 4.7 | 281 | 4.2 | 172 | 3.6 | 317 | 3.6 | | 3.3 | |
| Department of Housing and Urban Development | | | | | | | | | | | | 2.9 | 280 | 3.2 | 289 | 2.7 | 58 | 3.0 | 245 | 2.6 | 54 | 2.7 | | 2.2 | |
| Department of Transportation | | | | | | | | | | | | | | | | | | 4.7 | 424 | 4.5 | 662 | 4.5 | | 4.5 | |
| Atomic Energy Commission | | 3.5 | 618 | 2.0 | 43 | 2.7 | 43 | 2.4 | 124 | 2.3 | 36 | 2.6 | 83 | 2.4 | 90 | 2.3 | 495 | 2.2 | 76 | 1.6 | 99 | 2.2 | | 1.7 | |
| General Accounting Office | | 1.3 | 47 | 2.5 | 108 | 1.6 | 637 | 1.4 | 33 | 1.1 | 108 | 1.6 | 688 | 1.5 | 21 | 1.1 | 17 | 1.4 | 11 | .6 | 7 | | | | |
| General Services Administration | | 8.3 | 303 | 7.6 | 818 | 7.0 | 249 | 7.3 | 326 | 7.5 | 492 | 7.1 | 393 | 5.3 | 344 | 5.9 | 555 | 6.8 | 460 | 6.0 | 516 | 5.7 | | 6.4 | |
| Government Printing Office | | 6.1 | 279 | 7.1 | 625 | 6.8 | 217 | 8.5 | 331 | 10.0 | 379 | 7.0 | 275 | 6.8 | 292 | 6.9 | 506 | 8.1 | 203 | 6.3 | 268 | 5.4 | | 5.5 | |
| National Aeronautics and Space Administration | | 2.9 | 479 | 2.4 | 294 | 3.0 | 453 | 3.2 | 260 | 2.7 | 167 | 2.7 | 331 | 2.4 | 93 | 2.1 | 463 | 2.1 | 245 | 1.6 | 76 | 1.5 | | 1.8 | |
| Selective Service System | | 1.9 | 61 | 2.5 | 29 | 2.0 | 87 | 2.1 | 101 | 2.2 | 62 | 2.3 | 193 | 2.5 | 36 | 2.3 | 156 | 1.9 | 67 | 2.7 | 171 | 1.8 | | 1.6 | |
| Tennessee Valley Authority | | 6.7 | 1,263 | 8.5 | 2,253 | 9.4 | 2,386 | 10.3 | 1,231 | 9.5 | 1,980 | 9.8 | 2,350 | 7.4 | 2,072 | 8.6 | 41 | 7.1 | 2,331 | 6.9 | 1,298 | 6.5 | | 6.7 | |
| Veterans Administration | | 6.6 | 409 | 5.1 | 392 | 4.9 | 346 | 5.4 | 404 | 5.2 | 296 | 5.4 | 346 | 5.4 | 359 | 5.4 | 922 | 5.9 | 275 | 5.8 | 379 | 6.1 | | 6.0 | |

[1] Definitions of terms and survey methods are available upon request from DOL.
[2] Industry group totals (2- and 3-digit code numbers) are weighted (see technical notes) and include data for industries not shown separately.
[3] *Standard Industrial Classification Manual*, 1957 Edition for years 1958–67, with modifications o the 1963 supplement for years 1964–67, 1967 Edition for years 1968–69. The letter "P" in the code number indicates that the industry group is only a part of the total industry as defined.
[4] Compiled by the Bureau of Mines, U.S. Department of the Interior.
[5] Industry classifications not strictly comparable to the *Standard Industrial Classification Manual*.
[6] Except for anthracite and oil and natural gas, data for 1969 are preliminary and subject to change
[7] Compiled by the Bureau of Employees' Compensation, U.S. Department of Labor. Military personnel not included.
[8] Data for 1960 and 1961 are available from the Bureau of Mines, U.S. Department of the Interior, but are not directly comparable to those for 1962 and following years.
n.e.c. = Not elsewhere classified.

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# C. OCCUPATIONAL SAFETY AND HEALTH INSPECTION DATA—1971

TABLE C–1.—*Quarterly data resulting from inspections made under the provisions of the Williams-Steiger Occupational Safety and Health Act for the United States, calendar year 1971* [1]

| Inspection items | Quarter ending June 30 | Quarter ending Sept. 4 | Quarter ending Dec. 31 | Total 1971 |
|---|---|---|---|---|
| Total number of inspections and investigations | 1, 135 | 5, 388 | 7, 929 | 14, 452 |
| Number of general industry inspections | 344 | 2, 583 | 2, 827 | 5, 754 |
| Number of construction inspections | 8 | 178 | 917 | 1, 103 |
| Number of maritime inspections | 715 | 1, 805 | 1, 517 | 4, 037 |
| Number of complaint investigations [2] | 42 | 326 | 897 | 1, 265 |
| Number of accident investigations [2] | 26 | 496 | 493 | 1, 015 |
| Number of State section 7(c)(1) inspections | NA | NA | 1, 278 | 1, 278 |
| Number of complaints received | 120 | 436 | 733 | 1, 289 |
| Number of employees in inspected establishments | 134, 213 | 910, 960 | 1, 414, 541 | 2, 459, 714 |
| Total number of OSHA violations [3] | 879 | 10, 293 | 24, 667 | 35, 839 |
| Number of nonserious violations | 782 | 10, 063 | 24, 386 | 35, 321 |
| Number of serious violations | 7 | 228 | 256 | 491 |
| Number of imminent danger violations | | 2 | 3 | 5 |
| Number of willful or repeated violations | | | 22 | 22 |
| Number of de minimus notifications | 32 | 1, 700 | 1, 334 | 3, 066 |
| Total number of citations | 328 | 1, 831 | 7, 348 | 9, 507 |
| Number of establishments penalized | 15 | 549 | 4, 835 | 5, 399 |
| Total amount of proposed penalties | $12, 317 | $155, 029 | $570, 140 | $737, 486 |
| Total amount of penalties remitted | $269 | $31, 210 | $164, 941 | $196, 420 |

[1] Included are data from initial and followup general industry construction, and maritime inspections, complaint and accident investigations and State inspections performed under section 7(c)(1). Service Contract Act, Public Contracts Act, and Construction Safety Act inspections are included in the above categories and not counted separately. Section 7(c)(1) inspection data are not available prior to October 1971. Inspections made by Bureau of Labor Standards prior to Apr. 28, 1971, are not included.

[2] Includes general industry, construction, and maritime investigations.

[3] Does not include the number of de minimus notifications.

TABLE C–2.—*Cumulative totals of regional data resulting from inspections made under the provisions of the Williams-Steiger Occupational Safety and Health Act for the United States, calendar year 1971* [1]

| Regional offices [2] | Inspections | Violations [3] | Amount of proposed penalties | Citations | Complaints received |
|---|---|---|---|---|---|
| All regions | 13, 174 | 31, 053 | 673, 398 | 8, 425 | 1, 289 |
| Boston | 513 | 1, 051 | 28, 983 | 358 | 33 |
| New York | 3, 369 | 5, 556 | 103, 123 | 1, 524 | 98 |
| Philadelphia | 1, 630 | 2, 372 | 84, 437 | 638 | 129 |
| Atlanta | 1, 709 | 3, 565 | 104, 972 | 1, 061 | 189 |
| Chicago | 1, 804 | 7, 640 | 124, 434 | 2, 551 | 478 |
| Dallas | 1, 383 | 1, 669 | 46, 728 | 479 | 120 |
| Kansas City | 504 | 1, 270 | 66, 467 | 477 | 110 |
| Denver | 462 | 4, 749 | 30, 106 | 497 | 30 |
| San Francisco | 1, 031 | 1, 858 | 56, 901 | 573 | 76 |
| Seattle | 769 | 1, 323 | 27, 247 | 267 | 26 |

[1] Included are data from initial and followup general industry, construction, and maritime inspections, complaint and accident investigations. State inspections performed under section 7(c) (1) are excluded from this table. Service Contract Act, Public Contracts Act, and Construction Safety Act inspections are included in the above categories and not counted separately. Inspections made by the Bureau of Labor Standards prior to Apr. 28, 1971, are not included.

[2] OSHA region and State:

[3] Does not include the number of de minimus notifications.

BOSTON REGION:
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

NEW YORK REGION:
- New Jersey
- New York
- Puerto Rico

PHILADELPHIA REGION:
- Delaware
- District of Columbia
- Maryland
- Pennsylvania
- Virginia
- West Virginia

ATLANTA REGION:
- Alabama
- Florida
- Georgia
- Kentucky
- Mississippi
- North Carolina
- South Carolina

CHICAGO REGION:
- Illinois
- Indiana
- Michigan
- Minnesota
- Ohio
- Wisconsin

DALLAS REGION:
- Arkansas
- Louisiana
- New Mexico
- Oklahoma
- Texas

KANSAS CITY REGION:
- Iowa
- Kansas
- Missouri
- Nebraska

DENVER REGION:
- Colorado
- Montana
- North Dakota
- South Dakota
- Utah
- Wyoming

SAN FRANCISCO REGION:
- Arizona
- California
- Hawaii
- Nevada

SEATTLE REGION:
- Alaska
- Idaho
- Oregon
- Washington

# D. SUMMARY OF CASES CONTESTED— CALENDAR YEAR 1971

| | |
|---|---|
| Total number of cases filed | 358 |
| Cases withdrawn on motion of parties | 22 |
| Cases dismissed by Commission (because of procedural defects by employer) | 57 |
| Cases where citation has been vacated by Commission (on motion of, or because of procedural defects by Secretary of Labor) | 3 |
| Cases assigned for hearing before a hearing examiner | 130 |
| 1. Cases decided by an examiner | 26 |
| (a) Cases where examiner's decision became final (30 days having expired with no Commission member directing review) | 5 |
| (b) Cases where review of examiner's decision has been directed by a Commission member but the Commission has not yet finally decided the case | 10 |
| (c) Cases where examiner's decision has been pending with the Commission less than 30 days and no member has yet directed review | 11 |
| 2. Cases currently in hearing or awaiting a hearing date | 104 |
| Cases awaiting assignment to a hearing examiner | 146 |

Source: Occupational Safety and Health Review Commission.

# E. OSHA PUBLICATIONS

Copies of the following are available free of charge in limited quantities, from Administrative Services—Distribution, Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210, unless otherwise indicated.

*Occupational Safety and Health Act of 1970 PL 91–596.* (OSHA 2001).

*Recordkeeping Requirements Under the Williams-Steiger Occupational Safety and Health Act of 1970.* (OSHA 2002). A booklet on the recordkeeping responsibilities of employers. Included are copies of the OSHA recordkeeping forms and a display poster stating the purpose and scope of the Occupational Safety and Health Act.

*Recordkeeping Requirements for Farmers Under the Williams-Steiger Occupational Safety and Health Act of 1970.* (OSHA 2012). A booklet on the recordkeeping responsibilities of farm employers. Included are copies of the OSHA recordkeeping forms and a display poster stating the purpose and scope of the Occupational Safety and Health Act.

*Safety and Health Protection on the Job*—Poster. (OSHA 2003). A display poster stating the purpose and scope of the Occupational Safety and Health Act of 1970.

*Handy Reference Guide: Occupational Safety and Health Act of 1970.* (OSHA 2004). Pocket-sized 26-page guide to the Act, describing its coverage, purpose, penalties and other items every employer should know—20 cents a copy from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

*Fact Sheet for Small Businesses on Obtaining Compliance Loans.* (OSHA 2005). A two-page flier outlining the procedures on how small business establishments can obtain OSHA assistance in applying for Small Business Administration loans to aid them in meeting OSHA standards.

*Compliance Operations Manual.* (OSHA 2006). A manual containing definitive guidelines for all OSHA regional and area personnel to follow in implementing the Occupational Safety and Health Act of 1970, procedures for processing contested cases with the Review Commission, and information regarding citations, proposed penalties, and other OSHA activities. Arrangement for purchase should be made through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

*Safety and Health Training Resources Handbook.* (OSHA 2007). In press. A 150-page reference book published by the Federal Safety Council. The book covers safety and health training programs and materials available from Federal agencies.

*Safety Standards for Pulpwood Logging.* (OSHA 2008). A one-page flier focusing attention on the standard which establishes safety and health practices for pulpwood logging operations.

*Safety and Health Standards for Agriculture.* (OSHA 2009). A booklet containing the complete text of the safety standards applicable to agriculture. Reprinted from the Federal Register, May 29, 1971.

*The Farm Employer and the Occupational Safety and Health Act of 1970.* (OSHA 2010). In press. A folder on the four agricultural safety standards as well as the rights and obligations of farmers under the Williams-Steiger Act.

*The Safe Use of Anhydrous Ammonia.* (OSHA 2011). In press. A folder describing the injury potential of anhydrous ammonia fertilizer. Other sections of the folder contain information on what precautions to take to prevent accidents and what to do if an accident does occur while using this product.

*100 Questions and Answers About OSHA.* (OSHA 2013). In press. A booklet answering the 100 most frequently asked questions about OSHA. It contains sections on compliance, standards, recordkeeping, State programs, and several other categories.

*Safety Standards Magazine*

A magazine published by the Occupational Safety and Health Administration, Department of Labor, that covers the latest developments, techniques and programs affecting safety and health in the workplace. $1 per year. Send check or money order to Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

*Bureau of Labor Statistics Publications on Work Injuries*

| Subject | Publication date | Reference |
|---|---|---|
| Shipyards | 1943 | Bull. 722. |
| Foundry industry | 1944 | Bull. 805. |
| Longshore | 1944 | Bull. 764. |
| Slaughtering and meat-packing | 1945 | Bull. 855. |
| Shipyards | | |
| Shipyard injuries | 1944 | Serial No. R1952. |
| Basic accident factors | 1944 | Serial No. R1666. |
| Importance of minor injuries | 1944 | Serial No. R1680. |
| Work injuries to women (1943–44) | 1945 | Serial No. R1737. |
| Fatal work injuries (1943–44) | 1945 | Bull. 839. |
| Pulpwood-logging industry | 1948 | Bull. 924. |
| Shipyards | | Bull. 834. |
| Brewing industry | 1946 | Bull. 884. |
| Textile dyeing and finishing | 1949 | Bull. 962. |
| Crewmen on inland waterways | 1951 | Special Series No. 5. |
| Fertilizer manufacturing | 1949 | Bull. 949. |
| Manufacture of clay construction products | 1951 | Bull. 1023. |
| Carpentry operations | 1953 | Bull. 1118. |
| Construction | | Bull. 1004. |
| Manufacture of pulp and paper | 1952 | Bull. 1036. |
| Plumbing operations | 1952 | Bull. 1079. |
| Warehousing operations | 1955 | Bull. 1174. |
| Manufacture of paperboard containers | 1953 | Bull. 1139. |
| Boilershop-products industry | 1953 | Report 28. |
| | 1958 | Bull. 1237. |
| Circular saw | 1956 | Bull. 1190. |
| Canning of fruits and vegetables | 1956 | Report 101. |
| | 1961 | Report 183. |
| Fluid milk | 1954 | Report 62. |
| | 1961 | Report 196. |
| Water-supply utilities | 1955 | Report 83. |
| | 1960 | Report 166. |
| Hospitals | 1958 | Bull. 1219. |
| Soft drinks | 1956 | Report 104. |
| Fabrication of structural steel and architectural metal work | 1957 | Report 125. |
| | 1962 | Report 226. |
| Logging operations | 1960 | Report 154. |
| | 1963 | Report 252. |
| Sawmills | 1959 | Report 146. |
| | 1963 | Report 249. |
| Concrete brick and block | 1959 | Report 153. |
| | 1967 | Report 317. |
| Copperage | 1959 | Report 145. |
| School lunchrooms | no date | Report 159. |
| | 1967 | Report 316. |
| Injuries to minors | Contract job | |
| Hotels | 1962 | Report 230. |
| | 1967 | Report 329. |
| Highway and street construction industry | 1963 | Report 257. |
| Highway department industry | 1965 | Report 296. |
| Heavy construction | 1967 | Report 318. |
| Hospitals | 1968 | Report 340. |
| | 1968 | Report 341. |

# F. FEDERAL REGISTER

Listed below are issues of the Federal Register which contain information pertaining to the Occupational Safety and Health Act. Copies of the Federal Register are on file at all Federal Depository Libraries. Single copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 at 20 cents per copy. Subscriptions are available at $25 per year.

*Vol. 36, No. 22, Part II, pp. 1802-70, Feb. 2, 1971.*—Proposed Safety and Health Regulations for Construction. Proposed Amendments to Construction Safety Act, in detail. (29 CFR XII Part 1518).

*Vol. 36, No. 71, pp. 7006-7, Apr. 13, 1971.*—Part 1901—Procedures for State Agreements, Amendment to Title 29 of the Code of Federal Regulations, Rules of Procedure for Implementing Section 18(b) of the Williams-Steiger Act.

*Vol. 36, No. 75, Part II, pp. 7340-410, Apr. 17, 1971.*—Title 29, Chapter XIII, Part 1518—Safety and Health Regulations for Construction.

*Vol. 36, No. 86, p. 8311, May 4, 1971.*—Safety and Health Regulations for Construction: Effective date delayed to Aug. 15, 1971.

*Vol. 36, No. 87, pp. 8376-9, May 5, 1971.*—Title 29, CFR, Part 1903—Inspections, Citations and Proposed Assessment of Penalties.

*Vol. 36, No. 91, pp. 8693-5, May 11, 1971.*—Title 29, CFR, Part 1904—Recording and Reporting Occupational Injuries and Illnesses. Proposals on Recordkeeping.

*Vol. 36, No. 92, pp. 8754-5, May 12, 1971.*—Secretary of Labor's Order: Assistant Secretary for Occupational Safety and Health, Delegation of Authority and Assignment of Responsibility.

*Vol. 36, No. 94, pp. 8864-6, May 14, 1971.*—Title 29, Chapter XVII, Part 1950—Development and Planning Grants for Occupational Safety and Health.

*Vol. 36, No. 101, p. 9423, May 25, 1971.*—Title 29, Chapter XIII, Part 1518—Safety and Health Regulations for Construction. Corrections.

*Vol. 36, No. 104, pp. 9771-4, May 28, 1971.*—Chapter XIII, Part 1504—Safety and Health Regulations for Longshoring: Containerized Cargo; Cranes. Some delays in effective dates.

*Vol. 36, No. 105, pp. 9864-9, May 29, 1971.*—Title 29, Chapter V, Part 505—Labor Standards on Projects or Productions Assisted by Grants from the National Endowment for the Arts; Chapter XIII, Part 1516—Safety and Health Standards for Federal Service Contracts, Title 41, Chapter 50, Part 50-204—Safety and Health Standards for Federal Supply Contracts.

*Vol. 36, No. 105, Part II, pp. 10466-714, May 29, 1971.*—Occupational Safety and Health Standards; National Consensus Standards and Established Federal Standards. This is the major promulgation of standards under the Williams-Steiger Act.

*Vol. 36, No. 110, pp. 11738-42, June 18, 1971.*—Title 29, CFR, Part 1902—Development and Enforcement of State Standards. Procedures for Approval of State Plans.

*Vol. 36, No. 126, pp. 12290-5, June 30, 1971.*—Title 29, Chapter XVII, Part 1905—Rules of Practice for Variances, Limitations, Variations, Tolerances and Exemptions under the Williams-Steiger Occupational Safety and Health Act of 1970.

*Vol. 36, No. 128, pp. 12612-16, July 2, 1971.*—Title 29, Chapter XVII, Part 1904—Recording and Reporting Occupational Injuries and Illnesses.

*Vol. 36, No. 134, pp. 13071-2, July 13, 1971.*—State Agreements, Availability for Inspection.

*Vol. 36, No. 142, p. 13699, July 23, 1971.*—Health Services and Mental Health Administration, Occupational Health: Notice of Availability of Toxic Substances List at National Institute for Occupational Health, 5600 Fishers Lane, Rockville, Md., and Public Health Service Information Centers.

*Vol. 36, No. 144, p. 13849, July 27, 1971.*—Title 29, CFR, Part 1906—Administration Witnesses and Documents in Private Litigation, Policies and Procedures Concerning Compulsory Process.

*Vol. 36, No. 145, pp. 13891-3, July 28, 1971.*—Executive Order 11612: President Nixon's Order establishing occupational safety and health programs for Federal employees.

*Vol. 36, No. 157, pp. 15101-7, Aug. 13, 1971.*—Title 29, Chapter XVII, Part 1910—Occupational Safety and Health Standards, Some Changes in Effective Dates of Standards; Other Amendments.

*Vol. 36, No. 158, pp. 15437-8, Aug. 14, 1971.*—Title 29, Chapter XIII, Part 1518—Light Residential Construction; Effective Date. Chapter XVII, Part 1910—Light Residential Construction and Certain Other Construction; Effective Date.

*Vol. 36, No. 159, p. 15533, Aug. 17, 1971.*—Title 29, Chapter XIII, Part 1518—Safety and Health Regulations for Construction; Miscellaneous Amendments.

*Vol. 36, No. 162, pp. 16191-3, Aug. 20, 1971.*—Title 29, Chapter V, Part 505—Labor Standards on Projects or Productions Assisted by Grants from the National Endowment for the Arts, Chapter XIII, Part 1516—Safety and Health Standards for Federal Service Contracts; Removal of Assumptions, Certain Incorporations by Reference; Effective Date. Chapter 50, Part 50-204—Safety and Health Standards for Federal Supply Contracts; Presumptions and Incorporations by Reference; Specific National Consensus Standards; Effective Date.

*Vol. 36, No. 169, pp. 17409-17, Aug. 13, 1971.*—Title 29, Chapter XX, Occupational Safety and Health Review Commission, Part 2200—Rules of Procedure.

*Vol. 36, No. 170, pp. 17506-8, Sept. 1, 1971.*—Title 29, Chapter XVII, Part 1911—Rules of Procedure for Promulgating, Modifying, or Revoking Occupational Safety and Health Standards.

*Vol. 36, No. 173, pp. 17850-4, Sept. 4, 1971.*—Title 29, Chapter XVII, Part 1903—Inspections, Citations, and Proposed Penalties.

*Vol. 36, No. 175, pp. 18080-1, Sept. 9, 1971.*—Title 29, Chapter XVII, Part 1910—Applicability of Some Established Federal Standards.

*Vol. 36, No. 175, pp. 18128–9, Sept. 9, 1971.*—Occupational Safety and Health Administration. American Iron and Steel Institute and United Steel Workers of America. Petitions for Commencement of Rulemaking Proceedings and Related Relief.

*Vol. 36, No. 188, pp. 19083–89, Sept. 28, 1971.*—Title 29, CFR, Parts 1518, 1910—Safety and Health Regulations for Construction. Notice of Proposed Rulemaking.

*Vol. 36, No. 191, pp. 19266, Oct. 1, 1971.*—Title 29, CFR, Parts 1910 and 1518—Proposed Rulemaking; Clarification of Proposed Rulemaking, Sept. 28, 1971.

*Vol. 36, No. 203, pp. 20305–6, Oct. 20, 1971.*—Title 29, CFR, Part 1910—Powered Industrial Trucks; Proposed Rulemaking; Proposed Temporary Suspension for Certain Standards.

*Vol. 36, No. 208, p. 20716, Oct. 28, 1971.*—Occupational Safety and Health Review Commission; Disclosure of Information to the Public.

*Vol. 36, No. 209, pp. 20751–56, Oct. 29, 1971.*—Title 29, CFR, Part 1902—Development and Enforcement of State Standards.

*Vol. 36, No. 209, pp. 20772–79, Oct. 29, 1971.*—Title 29, CFR, Part 1518—Proposed Rulemaking; Rollover Protective Structures and Overhead Protection; Access Roadways and Grades.

*Vol. 36, No. 215, pp. 21334–5, Nov. 6, 1971.*—Title 13, CFR, Part 120.5—Displaced Business, Coal Mine Health and Safety, Consumer Protection, and Occupational Safety and Health Loans—loan policies.

*Vol. 36, No. 219, pp. 21687–88, Nov. 12, 1971.*—Title 29, CFR, Part 1904—Proposed Rulemaking; Use of Data Processing Equipment; Additional Time for Completing Forms; Posting of Annual Summary.

*Vol. 36, No. 228, pp. 22589–90, Nov. 25, 1971.*—Department of Labor, Occupational Safety and Health Administration; Title 29, CFR, Part 1904—Recording and Reporting Occupational Injuries and Illnesses; Proposed Statistical Reporting Program.

*Vol. 36, No. 234, pp. 23207–8, Dec. 7, 1971.*—Title 29, Chapter XVII, Part 1910—Occupational Safety and Health Standards; Emergency Standard for Exposure to Asbestos Dust.

*Vol. 36, No. 234, pp. 23207, Dec. 7, 1971.*—Title 29, Chapter XIII, Part 1518—Safety and Health Regulations for Construction; Standard for Exposure to Asbestos Dust.

*Vol. 36, No. 234, pp. 23217–18, Dec. 17, 1971.*—Title 41, Chapter 50, Part 50–204—Safety and Health Standards for Federal Supply Contracts; Standard for Exposure to Asbestos Dust.

*Vol. 36, No. 249, p. 25061, Dec. 28, 1971.*—National Advisory Committee on Occupational Safety and Health. Advice, Consultations, and Recommendations under Williams-Steiger Occupational Safety and Health Act of 1970. Notice of Meeting Open to Public.

*Vol. 36, No. 251, p. 25229, Dec. 30, 1971.*—Title 29, Chapter XIII, Bureau of Labor Standards, Department of Labor; Part 1501—Safety and Health Regulations for Ship Repairing; Part 1502—Safety and Health Regulations for Shipbuilding; Part 1503—Safety and Health Regulations for Shipbreaking; Part 1504—Safety and Health Regulations for Longshoring; Part 1505—Gear Certification; Part 1506—Recording and Reporting Work-Injury Frequency and Severity Data Concerning Longshoremen, Ship Repairmen and Other Harbor Workers; Part 1507—Procedure for Variations from Safety and Health Regulations Under Longshoremen's and Harbor Workers' Compensation Act; Part 1508—Rules of Practice in Enforcement Proceedings Under Section 41 of the Longshoremen's and Harbor Workers' Compensation Act; Part 1509—Investigational Hearings Under Section 41 of the Longshoremen's and Harbor Workers' Compensation Act; Part 1510—Safety and Health Provisions for Federal Agencies; Part 1515—Safety Standards for Federal Service Contracts; and Part 1518—Safety and Health Regulations for Construction. Transfer of Regulations and Revocation of Part.

*Vol. 36, No. 251, pp. 25232–33, Dec. 30, 1971.*—Title 29, Part 1915—Safety and Health Regulations for Ship Repairing; Part 1916—Safety and Health Regulations for Shipbuilding; Part 1917—Safety and Health Regulations for Shipbuilding; Part 1918—Safety and Health Regulations for Longshoring; Part 1919—Gear Certification; Part 1920—Procedure for Variations from Safety and Health Regulations Under Longshoremen's and Harbor Workers' Compensation Act; Part 1921—Rules of Practice in Enforcement Proceedings Under Section 41 of the Longshoremen's and Harbor Workers' Compensation Act; Part 1922—Investigational Hearings Under Section 41 of the Longshoremen's and Harbor Workers' Compensation Act; Part 1923—Safety and Health Provisions for Federal Agencies; Part 1924—Safety Standards Applicable to Workshops and Rehabilitation Facilities Assisted by Grants; Part 1925—Safety and Health Standards for Federal Service Contracts; and Part 1926—Safety and Health Regulations for Construction, Redesignation.

*Vol. 36, No. 251, pp. 252230–32, Dec. 30, 1971.*—Chapter XVII—Occupational Safety and Health Administration, Department of Labor. Part 1912—Advisory Committees on Standards.

*Vol. 36, No. 252, pp. 25431, Dec. 31, 1971.*—Title 29, CFR, Part 1926—Safety and Health Regulations for Construction. Cranes and Derricks; Use of Boom Angle Indicators, Load Indicators, Weight-Moment Indicators, Overload Protective Devices.

# G. SUMMARY OF STATE GRANT ACTIVITY—1971

| Jurisdiction | Planning grants (section 23) | Statistical planning grants (section 24) | Target industries program (section 7) |
|---|---|---|---|
| Boston: | | | |
| Connecticut | $68, 860 | $14, 919 | ---- |
| Maine | 76, 374 | 13, 770 | ---- |
| Massachusetts | 97, 394 | 10, 900 | ---- |
| New Hampshire | 30, 546 | 8, 025 | ---- |
| Rhode Island | 53, 230 | 9, 997 | ---- |
| Vermont | 37, 279 | 9, 200 | ---- |
| New York: | | | |
| New Jersey | 180, 330 | 19, 513 | ---- |
| New York | 135, 683 | 16, 989 | $111, 200 |
| Puerto Rico | 50, 000 | 19, 287 | ---- |
| Virgin Islands | ---- | 14, 300 | ---- |
| Philadelphia: | | | |
| Delaware | 75, 502 | 12, 725 | ---- |
| District of Columbia | 59, 681 | 18, 000 | ---- |
| Maryland | 32, 855 | 13, 000 | ---- |
| Pennsylvania | 147, 657 | 23, 443 | 151, 800 |
| Virginia | 70, 872 | 18, 271 | ---- |
| West Virginia | 107, 945 | 14, 400 | ---- |
| Atlanta: | | | |
| Alabama | 96, 300 | ---- | ---- |
| Florida | 76, 623 | 13, 844 | 56, 191 |
| Georgia | 115, 071 | 17, 208 | ---- |
| Kentucky | 120, 000 | 13, 591 | ---- |
| Mississippi | 84, 325 | 12, 556 | ---- |
| North Carolina | 89, 152 | 14, 571 | 114, 016 |
| South Carolina | 91, 725 | 17, 106 | ---- |
| Tennessee | 174, 792 | 18, 248 | ---- |
| Chicago: | | | |
| Illinois | 150, 350 | 23, 000 | 84, 550 |
| Indiana | 38, 000 | 19, 305 | ---- |
| Michigan | 149, 000 | 25, 000 | ---- |
| Chicago–Continued | | | |
| Minnesota | $112, 447 | $23, 772 | ---- |
| Wisconsin | 150, 000 | 33, 700 | ---- |
| Dallas: | | | |
| Arkansas | 78, 284 | 13, 531 | ---- |
| Louisana | 112, 300 | 24, 710 | ---- |
| New Mexico | 47, 218 | 23, 210 | ---- |
| Oklahoma | 92, 437 | 11, 961 | ---- |
| Texas | 113, 168 | 15, 577 | ---- |
| Kansas City: | | | |
| Colorado | 153, 584 | 18, 815 | ---- |
| Iowa | 82, 108 | 19, 214 | ---- |
| Kansas | 99, 019 | 15, 098 | ---- |
| Missouri | 101, 761 | 23, 211 | ---- |
| Montana | 132, 475 | 14, 079 | ---- |
| Nebraska | 77, 864 | 16, 700 | ---- |
| North Dakota | 68, 992 | 18, 104 | ---- |
| South Dakota | ---- | 12, 093 | ---- |
| Utah | 83, 453 | 12, 536 | ---- |
| Wyoming | 96, 731 | 15, 559 | ---- |
| San Francisco: | | | |
| Alaska | 111, 463 | 16, 000 | ---- |
| Arizona | 75, 375 | 13, 000 | ---- |
| California | 210, 000 | 27, 000 | $178, 063 |
| Guam | ---- | 17, 478 | ---- |
| Hawaii | ---- | 14, 000 | ---- |
| Idaho | 98, 579 | 13, 000 | ---- |
| Nevada | ---- | 23, 664 | ---- |
| Oregon | 97, 327 | 13, 000 | 84, 850 |
| Washington | 100, 000 | 12, 362 | 105, 650 |
| Total | $4, 704, 131 | $872, 542 | $886, 320 |

# H. SUMMARY OF CONTRACT ACTIVITY—1971

| Contract title and number | Contractor | Start date | Completion date | Final report received | Contract amount |
|---|---|---|---|---|---|
| 1. *Communication Effectiveness.* L–71–178 | Roy Littlejohn Associates, Inc., Washington, D.C. | July 1, 1971 | Sept. 30, 1971 | Sept. 30, 1971 | $40,000 |
| To determine the most effective methods of informing employers and employees on occupational safety and health and motivating them to take action to improve occupational safety and health. | | | | | |
| 2. *Inspection Effectiveness Study.* L–71–176 | State of Wisconsin, Department of Industry, Labor and Human Relations, Madison, Wis. | June 24, 1971 | Sept. 30, 1971 | Sept. 30, 1971 | 25,000 |
| To determine the relationship between hazards observed by an external inspection agency and the actual causes of work-related injuries and illnesses. | | | | | |
| 3. *Evaluation of Construction Training.* L–71–188 | J. A. Reyes Associates, Washington, D.C. | Sept. 22, 1971 | Sept. 30, 1971 | Sept. 30, 1971 | 38,100 |
| To evaluate the construction training already accomplished and to determine methods for obtaining greatest use of instructors trained under the construction program. | | | | | |
| 4. *Employer Listings.* L–71–149 | Dun & Bradstreet, Washington, D.C. | June 10, 1971 | July 30, 1971 | July 30, 1971 | 15,000 |
| To supply employer address listings broken down by each area office with copies of listings available at area, regional, and national offices. | | | | | |
| 5. *Extension of Construction Training Courses.* L–70–133 | Middle West Service Co., Chicago, Ill. | Modification I<br>May 12, 1971 | June 30, 1972 | Dec. 17, 1971 | 63,600 |
| | | Modification II<br>June 18, 1971 | Oct. 30, 1971 | Dec. 8, 1971 | |
| To add 10 courses to the construction training effort and have the contractor provide course materials for instructors. | | | | | |
| 6. *OSHA Organizational Study.* L–71–176 | Abt Associates, Inc., Cambridge, Mass. | Aug. 2, 1971 | Nov. 18, 1971 | Nov. 18, 1971 | 58,000 |
| To evaluate the OSHA organization, the lines of accountability within it and the suitability of the organization and individual functions to the goals established in the Act. | | | | | |

# H. SUMMARY OF CONTRACT ACTIVITY—1971—Continued

| Contract title and number | Contractor | Start date | Completion date | Final report received | Contract amount |
|---|---|---|---|---|---|
| 7. *Support of Target Industry Program* L–71–181 | National Safety Council, Chicago, Ill. | June 29, 1971 | June 1972 | | 7, 500 |
| To cover travel and related expenses of the NSC's participation in the TIP. | | | | | |
| 8. *Employer Cost/Benefit Analysis* L–71–192 | National Safety Council, Chicago, Ill. | June 29, 1971 | On-going | | 96, 000 |
| To test the feasibility of developing a methodology for cost/benefit analysis for individual business establishment to show the consequences of effective industrial safety programs in economic terms. | | | | | |
| 9. *Systems Project* L–71–204 | PRC Information Sciences Co., McLean, Va. | June 28, 1971 | On-going | | 204, 000 |
| To develop a management information system for OSHA. | | | | | |
| 10. *Collection, Translation of International Standards* L–71–182 | New York University, New York, N.Y. | June 21, 1971 | June 26, 1972 Estimated | | 150, 000 |
| To identify, translate and abstract international standards for reference and study by OSHA. | | | | | |
| 11. *Technical Information Retrieval System* L–71–189 | SBA-Systems Research Co., Philadelphia, Pa. | June 28, 1971 | July 1972 | | 163, 000 |
| To develop a plan for the rapid retrieval of information from a large technical standards library or data base. | | | | | |
| 12. *Orientation Courses* L–71–213 | The Boeing Co., Aerospace Group, Seattle, Wash. | June 3, 1971 | Dec. 31, 1971 | Jan. 11, 1972 | 65. 000 |
| To orient members of organized labor as to their rights and responsibilities under the OSH Act of 1970. | | | | | |
| 13. *Programmed Instruction* L–71–183 | Rowland & Co., Inc., Haddonfield, N.J. | June 30, 1971 | June 30, 1972 | June 30, 1972 | 110, 000 |
| To develop a programmed instruction manual on occupational safety and health for supervisors within industry. | | | | | |
| 14. *Compliance Officer Training* L–71–205 | Human Resources Research Organization, Alexandria, Va. | June 21, 1971 | Jan. 31, 1972 | Jan. 31, 1972 | 78, 000 |
| To develop a model which can be used for courses to instruct various classifications of safety and health compliance officers. | | | | | |

# REPORT ON OCCUPATIONAL SAFETY AND HEALTH BY THE U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Elliot L. Richardson,
Secretary

# FOREWORD

The Occupational Safety and Health Act of 1970 (P.L. 91–596) requires the Department of Health, Education, and Welfare to submit to the President and the Congress, two annual reports: Section 26 of the Act requires a report from the Secretary of Health, Education, and Welfare on the subject matter of the Act, and section 22 of the Act requires a report from the Director of the National Institute for Occupational Safety and Health describing the activities of the Institute under the Act.

All Department of Health, Education, and Welfare functions under the Occupational Safety and Health Act of 1970, except for the authority to appoint a Director for the Institute, to appoint representatives to advisory committees, and to function as an ex officio member of the National Commission on State Workmen's Compensation Laws have been delegated to the Director of the National Institute for Occupational Safety and Health. Therefore, this foreword will describe my activities under the Act and the remainder of the report will describe the activities of the National Institute for Occupational Safety and Health.

Immediately after the passage of the Act, the responsibilities vested in the Secretary, Department of Health, Education, and Welfare (with the exception of those previously noted) were delegated to the Director of the former Bureau of Occupational Safety and Health. That individual was Dr. Marcus M. Key, whom I have subsequently appointed as Director of the newly authorized National Institute for Occupational Safety and Health. The Institute itself was officially organized in June 1971 and was placed in the Health Services and Mental Health Administration of the Department where a majority of the health programs promoting clinical and preventive health activities are grouped. This organizational setting should permit the National Institute for Occupational Safety and Health to function closely with other programs designed to improve the health status of the population of the United States through its focus on prevention as well as health care delivery systems.

In my capacity as ex officio member of the National Commission on State Workmen's Compensation Laws during 1971, I have drawn upon the services of Dr. Key and other members of the Department to participate in the study and objective evaluation of the existing workmen's compensation laws. This Presidentially appointed committee will present the report of its comprehensive study to the Executive and Legislative Branches no later than July 31, 1972, making a detailed statement of conclusions with appropriate recommedations.

The Act provides that the Secretary of Health, Education, and Welfare shall designate four of the twelve members of the National Advisory Committee on Occupational Safety and Health which is appointed by the Secretary of Labor to advise both Departments on matters relating to administration of the Act. The individuals whom I have designated to serve on the committee are:

Miss Sara P. Wagner, R.N.
Dr. Richard A. Sutter
Mr. Roger H. Wingate
Mr. Leif Thorne-Thomsen

The responsibilities facing the Department of Health, Education, and Welfare and particularly the National Institute for Occupational Safety and Health in implementing the Act are challenging and the body of this report describes the initial progress towards achievement of the purposes of this Act. We in the Department of Health, Education, and Welfare look forward to progressively broader activities in concert with the Department of Labor leading to a substantive improvement in the health and safety status of our mutual constituency.

Elliot L. Richardson

*Secretary*

# SUMMARY


Under the Occupational Safety and Health Act of 1970, the Department of Health, Education, and Welfare has primary responsibilities in the area of health and safety research; hazard evaluations and toxicity determinations; annual listing of toxic substances; and manpower development and training. The most important research activity is that which produces criteria on which standards for toxic materials and harmful physical agents can be established by the Secretary of Labor. Industrywide studies of chronic or low-level industrial exposures on the potential for illness, disease, or loss of functional capacity and research into psychological, motivational, and behavioral factors also produce criteria for standards and are being carried out as required by the Act.

Secondary responsibilities in the compilation of health and safety statistics, dissemination of technical information, and employer-employee education are complementary to the Department of Labor activities.

The Department of Health, Education, and Welfare reorganized its Bureau of Occupational Safety and Health as the National Institute for Occupational Safety and Health (NIOSH) in the Health Services and Mental Health Administration to meet the demands of the Act and to carry out its mandates.

NIOSH has established research programs within the areas of toxicology, physical and chemical analysis, physiology and ergonomics, engineering, psychology, physical agents, and epidemiology (industrywide studies). These programs are primarily directed toward the development or modification of criteria which are used for recommending health or safety standards for promulgation by the Department of Labor. During 1971, a criteria package on asbestos was completed for transmittal to the Secretary of Labor and work was begun on 10 other criteria documents.

The NIOSH research program is directed toward high priority toxic substances and physical agents. The priorities for developing criteria and conducting research have been established and will be reviewed annually for needed revision to reflect new data.

In order to develop this data, NIOSH has undertaken surveillance activities which are designed to identify and define the potential for occupational health problems and to measure the magnitude and extent of these problems as manifested by existing or recorded illnesses and deaths.

A technical service program has been established by NIOSH to provide consultative services and technical assistance to employers and employees on the engineering and industrial hygiene aspects of occupational safety and health hazards.

Included in this program is a hazard evaluation service which responds to requests for toxicity determination from both employers and employees' representatives as required by the Act. This program is designed to determine whether any substance normally found in the workplace has potentially toxic effects in the concentrations used. During the initial stages of the program in 1971, some 25 requests for hazard evaluation were received identifying approximately 75 substances for which toxicity determinations were needed.

The NIOSH technical service program also provides medical and nursing consultation to industry, State and local governmental agencies, and employee groups to prevent occupational disease and injury.

Additionally, NIOSH maintains a center for the acquisition, abstracting and dissemination of technical information in the field of occupational safety and health. Technical responses are made to inquiries from the general public, official agencies, universities, and other sources.

In accord with the provisions of the Act, NIOSH published *Toxic Substance Annual List, 1971.* Approximately 8,000 substances were included in this list which provides a convenient reference source for potentially hazardous ma-

terial and serves as a guide for research needed in setting new occupational health standards.

Providing an adequate supply of qualified personnel to carry out the purposes of the Act has received major attention. Estimates have been made of the number of occupational safety and health professionals needed in the overall manpower pool based on NIOSH studies and on information provided by professional societies. The number of professionals presently needed to fill the estimated demands are: 1,000 industrial hygienists, 8,000 occupational health nurses, 3,000 industrial physicians, 8,000 occupational health scientists, and 10,000 safety/health professionals.

In answer to these needs, NIOSH has begun implementation of an enlarged manpower development program. Training grants have been awarded to educational and other nonprofit institutions providing graduate or specialized programs in occupational safety and health. These grants have as a purpose initiating, strengthening, and expanding graduate, undergraduate and special training programs in order to ensure an adequate supply of qualified occupational safety and health personnel. In 1971, 734 students were enrolled in NIOSH supported courses while 152 students received stipends.

Short courses have also been established by NIOSH to provide introductory, intermediate, and advanced training and continuing education for the various types of professionals in occupational safety and health. Courses are provided in the areas of health maintenance and environmental management. In 1971, 6,500 man-days of training were provided to occupational safety and health professionals, the majority of whom were employees of Federal, State, or local government agencies.

A study will be done to determine the feasibility of obtaining exact National and regional projections of the manpower needs in occupational safety and health.

In 1972, NIOSH intends to continue its research activities as mandated under the Act and to measure their effectiveness and scope. Ten criteria documents should be finalized for transmittal to the Department of Labor including beryllium, cotton dust, carbon monoxide, lead, mercury, heat stress, noise, ultraviolet light, and silica. In addition, work will be initiated for 20 criteria documents including benzene, trichloroethylene, toluene, toluene diisocyanate, cadmium, chromic acid, fibrous glass, parathion, coal tar pitch volatiles, carcinogens, arsenic, lasers, microwaves, industrial X-rays, sulfuric acid, and sulfur dioxide.

The Technical Services Program is expected to grow rapidly. It is anticipated that over 600 requests for hazard evaluations will be received in 1972 and that the number of inquiries for technical information will double from 1971.

The *Toxic Substances—Annual List, 1972* will contain many more entries than in 1971, especially in the areas of carcinogens and neoplastic agents. It is also intended to provide more information about each substance.

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## Chapter 1

# ORGANIZATION AND ADMINISTRATION

The National Institute for Occupational Safety and Health (NIOSH) was authorized on April 28, 1971, and became effective on June 30, 1971, with the publication of an Organizational and Functional Statement in the *Federal Register* (see Appendix A). The history of occupational health within the Department of Health, Education, and Welfare, and its predecessor organizations in the Executive Branch of Government, goes back to the pre-World War I era when the Office of Industrial Hygiene and Sanitation was established in the Public Health Service at Pittsburgh, Pennsylvania. The complementing safety function has been added to the HEW organization only recently. In the early years of operation, the organization was responsible for many of the classic studies in the dusty trades, including those relating to pottery workers, hatters, foundry workers, and miners. Through subsequent reorganization, the Office of Industrial Hygiene and Sanitation was combined with the Office of Dermatosis Investigations to become the Division of Industrial Hygiene, which was subsequently placed in the National Institutes of Health in 1939.

During World War II, there was a substantial increase in the industrial hygiene activities of the Public Health Service related to the National effort. After the War, however, the reorganization of the Public Health Service within the Federal Security Agency brought about a transfer of the Division of Industrial Hygiene from the National Institutes of Health to the Bureau of State Services, and resources were reduced to a level commensurate with the advisory and consultative authority of the organization. Several subsequent reorganizations took place up to the time of the passage of the Federal Coal Mine Health and Safety Act of 1969.

During the year between the enactment of the Federal Coal Mine Health and Safety Act and the enactment of the Occupational Safety and Health Act of 1970, additional reorganization was brought about by the creation of the Environmental Protection Agency. The Bureau of Occupational Safety and Health, which was at that time fulfilling the technical and consultative activities of the Department of Health, Education, and Welfare under the Public Health Service Act and the more specific mandates of the medical and research authorities of the Federal Coal Mine Health and Safety Act, was separated from the general environmental programs with which it had been associated in the Consumer Protection and Environmental Health Service and was retained within the Department of Health, Education, and Welfare.

In 1971, the Bureau of Occupational Safety and Health was reorganized as NIOSH in the Health Services and Mental Health Administration (see Charts 1–1 and 1–2) to carry out HEW's responsibilities under the Occupational Safety and Health Act of 1970 and also the responsibilities of the Department (except for Black Lung Benefits) under the Federal Coal Mine Health and Safety Act of 1969. (See Appendix B for chronology of organizational identification 1914–1971.) NIOSH was established with seven staff Offices and six operating Divisions, supported by staff assigned to each of the ten Regional Offices of HEW. NIOSH is organized functionally rather than according to professional categories, reflecting a multidisciplinary approach to each major activity. An operating division is identified for each major activity, i.e.:

—for health and safety research, the Division of Laboratories and Criteria Development;

Chart 1-1

OMP January 1972

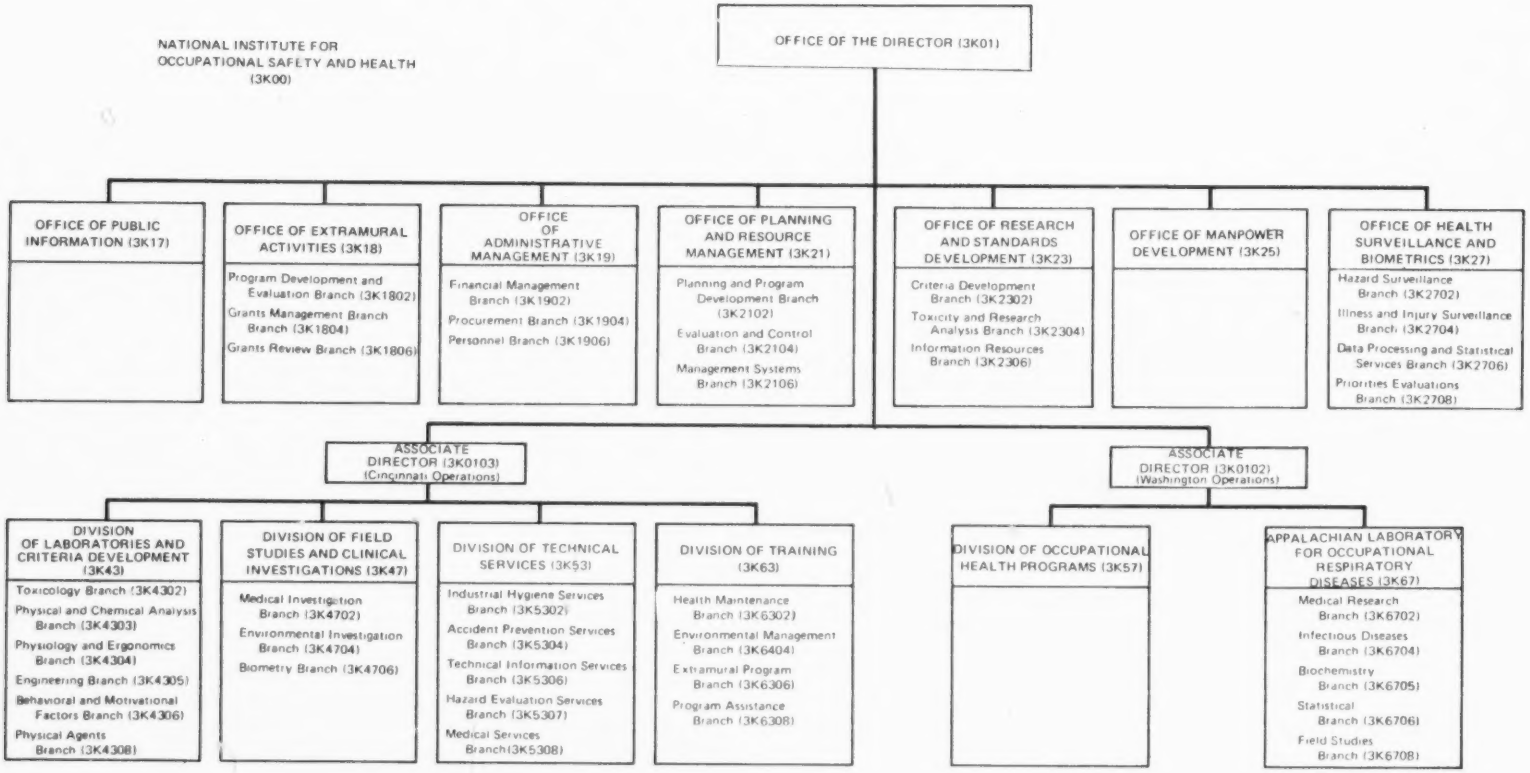
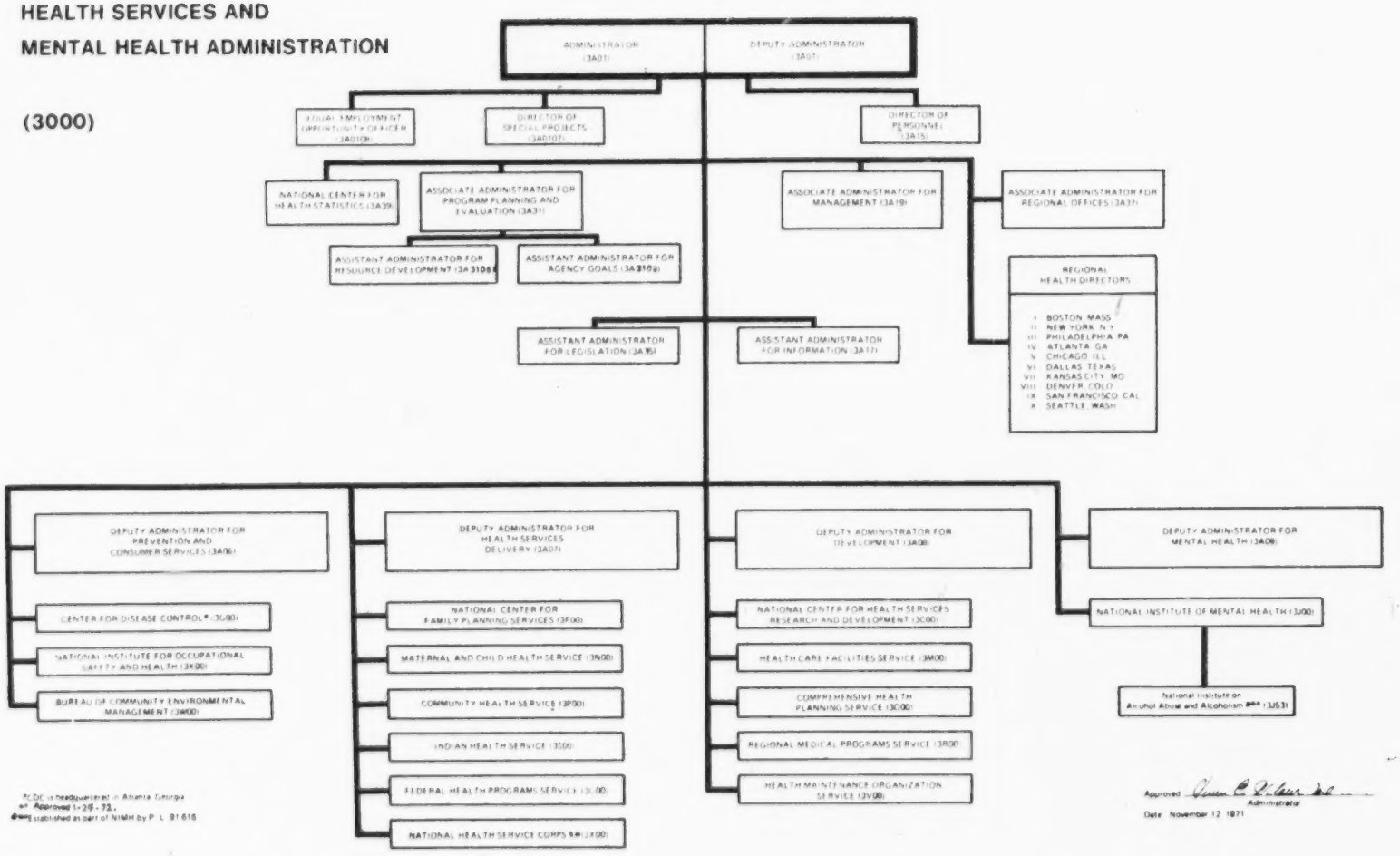

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (3K00)
OFFICE OF THE DIRECTOR (3K01)
OFFICE OF PUBLIC INFORMATION (3K17)
OFFICE OF EXTRAMURAL ACTIVITIES (3K18)
Program Development and Evaluation Branch (3K1802)
Grants Management Branch Branch (3K1804)
Grants Review Branch (3K1806)
OFFICE OF ADMINISTRATIVE MANAGEMENT (3K19)
Financial Management Branch (3K1902)
Procurement Branch (3K1904)
Personnel Branch (3K1906)
OFFICE OF PLANNING AND RESOURCE MANAGEMENT (3K21)
Planning and Program Development Branch (3K2102)
Evaluation and Control Branch (3K2104)
Management Systems Branch (3K2106)
OFFICE OF RESEARCH AND STANDARDS DEVELOPMENT (3K23)
Criteria Development Branch (3K2302)
Toxicity and Research Analysis Branch (3K2304)
Information Resources Branch (3K2306)
OFFICE OF MANPOWER DEVELOPMENT (3K25)
OFFICE OF HEALTH SURVEILLANCE AND BIOMETRICS (3K27)
Hazard Surveillance Branch (3K2702)
Illness and Injury Surveillance Branch (3K2704)
Data Processing and Statistical Services Branch (3K2706)
Priorities Evaluations Branch (3K2708)
ASSOCIATE DIRECTOR (3K0103) (Cincinnati Operations)
ASSOCIATE DIRECTOR (3K0102) (Washington Operations)
DIVISION OF LABORATORIES AND CRITERIA DEVELOPMENT (3K43)
Toxicology Branch (3K4302)
Physical and Chemical Analysis Branch (3K4303)
Physiology and Ergonomics Branch (3K4304)
Engineering Branch (3K4305)
Behavioral and Motivational Factors Branch (3K4306)
Physical Agents Branch (3K4308)
DIVISION OF FIELD STUDIES AND CLINICAL INVESTIGATIONS (3K47)
Medical Investigation Branch (3K4702)
Environmental Investigation Branch (3K4704)
Biometry Branch (3K4706)
DIVISION OF TECHNICAL SERVICES (3K53)
Industrial Hygiene Services Branch (3K5302)
Accident Prevention Services Branch (3K5304)
Technical Information Services Branch (3K5306)
Hazard Evaluation Services Branch (3K5307)
Medical Services Branch(3K5308)
DIVISION OF TRAINING (3K63)
Health Maintenance Branch (3K6302)
Environmental Management Branch (3K6404)
Extramural Program Branch (3K6306)
Program Assistance Branch (3K6308)
DIVISION OF OCCUPATIONAL HEALTH PROGRAMS (3K57)
APPALACHIAN LABORATORY FOR OCCUPATIONAL RESPIRATORY DISEASES (3K67)
Medical Research Branch (3K6702)
Infectious Diseases Branch (3K6704)
Biochemistry Branch (3K6705)
Statistical Branch (3K6706)
Field Studies Branch (3K6708)

Chart 1-2

## HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

## (3000)


ADMINISTRATOR (3A01)
DEPUTY ADMINISTRATOR (3A07)
EQUAL EMPLOYMENT OPPORTUNITY OFFICER (3A01C)
DIRECTOR OF SPECIAL PROJECTS (3A01C)
DIRECTOR OF PERSONNEL (3A15)
NATIONAL CENTER FOR HEALTH STATISTICS (3A39)
ASSOCIATE ADMINISTRATOR FOR PROGRAM PLANNING AND EVALUATION (3A31)
ASSOCIATE ADMINISTRATOR FOR MANAGEMENT (3A19)
ASSOCIATE ADMINISTRATOR FOR REGIONAL OFFICES (3A37)
ASSISTANT ADMINISTRATOR FOR RESOURCE DEVELOPMENT (3A31C5)
ASSISTANT ADMINISTRATOR FOR AGENCY GOALS (3A31C6)
REGIONAL HEALTH DIRECTORS
I BOSTON MASS
II NEW YORK N Y
III PHILADELPHIA PA
IV ATLANTA GA
V CHICAGO ILL
VI DALLAS TEXAS
VII KANSAS CITY MO
VIII DENVER COLO
IX SAN FRANCISCO CAL
X SEATTLE WASH
ASSISTANT ADMINISTRATOR FOR LEGISLATION (3A35)
ASSISTANT ADMINISTRATOR FOR INFORMATION (3A17)
DEPUTY ADMINISTRATOR FOR PREVENTION AND CONSUMER SERVICES (3A06)
DEPUTY ADMINISTRATOR FOR HEALTH SERVICES DELIVERY (3A07)
DEPUTY ADMINISTRATOR FOR DEVELOPMENT (3A08)
DEPUTY ADMINISTRATOR FOR MENTAL HEALTH (3A09)
CENTER FOR DISEASE CONTROL* (3G00)
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (3R00)
BUREAU OF COMMUNITY ENVIRONMENTAL MANAGEMENT (3W00)
NATIONAL CENTER FOR FAMILY PLANNING SERVICES (3F00)
MATERNAL AND CHILD HEALTH SERVICE (3N00)
COMMUNITY HEALTH SERVICE (3P00)
INDIAN HEALTH SERVICE (3S00)
FEDERAL HEALTH PROGRAMS SERVICE (3C00)
NATIONAL HEALTH SERVICE CORPS (3H00)
NATIONAL CENTER FOR HEALTH SERVICES RESEARCH AND DEVELOPMENT (3C00)
HEALTH CARE FACILITIES SERVICE (3M00)
COMPREHENSIVE HEALTH PLANNING SERVICE (3C00)
REGIONAL MEDICAL PROGRAMS SERVICE (3R00)
HEALTH MAINTENANCE ORGANIZATION SERVICE (3V00)
NATIONAL INSTITUTE OF MENTAL HEALTH (3J00)
National Institute on Alcohol Abuse and Alcoholism** (3J03)

* CDC is headquartered in Atlanta, Georgia
** Approved 1-28-72.
*** Established as part of NIMH by P. L. 91-616

Approved: [signature] Administrator

Date: November 12, 1971

—for industry-wide epidemiological studies, the Division of Field Studies and Clinical Investigations;

—for technical and clinical services including back-up resources for hazard evaluations, the Division of Technical Services;

—for professional training, the Division of Training;

—for promotion of new occupational health programs at the State and local levels and in industry and agriculture, the Division of Occupational Health Programs;

—for injury and illness intelligence, the Office of Health Surveillance and Biometrics;

—for research and training grants, the Office of Extramural Activities; and

—for implementation of HEW's responsibilities (except for Black Lung Benefits) under the Federal Coal Mine Health and Safety Act, the Appalachian Laboratory for Occupational Respiratory Diseases.

The functions of the Secretary of HEW under the Act are, to the extent feasible, delegated to the Director of NIOSH. NIOSH, therefore, is authorized to perform all of the functions of the Secretary of HEW under the provisions of the Research and Related Activities and the Training and Employee Education sections of the Act (sections 20 and 21). The Secretary of HEW retains the authority to appoint a Director for NIOSH, to appoint representatives to advisory committees, and to function as the ex officio member of the National Commission on State Workmen's Compensation Laws. Among the authorities delegated to the Director of NIOSH by the Secretary of HEW is the right to verify to the Secretary of Labor that a variance from an existing standard is necessary to allow an employer to participate in a research experiment approved by NIOSH; to conduct research medical examinations; to make recommendations to the Department of Labor regarding the need for mandatory standards; to cooperate in the prescription of regulations requiring the taking and keeping of records regarding employers' activities relating to the Act; to cooperate with the Secretary of Labor in prescribing regulations requiring employers to maintain accurate records of work-related deaths, injuries, and illnesses, as well as employee exposures to potentially toxic or harmful physical agents; to provide consultation to the Department of Labor on the approval or rejection of State grant applications; to compile, analyze, and publish reports or information; to conduct directly, or by grants or contracts, research, experiments, and demonstrations relating to occupational safety and health; to develop and publish, at least annually, a list of all known toxic substances; to determine, following written request by an employer or authorized representative of employees, whether substances used or found in the workplace have potentially toxic effects at the concentrations used or found; to conduct and publish industry-wide studies on the effect of chronic or low-level exposure to industrial materials, processes, and stresses; to make surveys and question employees; and to conduct education programs to provide an adequate supply of qualified personnel to carry out the purposes of the Act. In addition, a variety of administrative authorities exist in section 22 of the Act which created NIOSH.

NIOSH headquarters are located in Rockville, Maryland while most NIOSH research, technical assistance, and training activities under the Act are conducted at NIOSH facilities in Cincinnati, Ohio. Additional research and technical assistance is conducted at NIOSH facilities in Salt Lake City, Utah. The NIOSH Testing and Certification Laboratory as described in Chapter 6 is housed along with NIOSH's Appalachian Laboratory for Occupational Respiratory Diseases in NIOSH's new Appalachian Center for Occupational Safety and Health in Morgantown, West Virginia. The new Center was dedicated on November 27, 1971. (See Appendix C for dedication message from the Secretary of HEW.)

In order to carry out its functions under the Act as expeditiously as possible during fiscal year 1971, the Congress enacted a supplemental appropriation of $4,000,000. In addition, a $8,435,000 budget amendment was added to the 1972 budget request specifically for implementation of the Occupational Safety and Health Act. A total of $26,466,000 was appropriated for occupational safety and health activities in 1972.

Section 22(e) of the Act provides that the Di-

rector of NIOSH may accept and utilize money and other property donated or bequeathed to NIOSH. During 1971, NIOSH received one such donation from an individual.

## Chapter 2

# OCCUPATIONAL SAFETY AND HEALTH PROBLEMS

### BACKGROUND

Over 80 million American men and women spend 25 percent of their lives in the workplace. The deterioration in health quality which occurs as a result of exposure to hazards in the workplace is not well known because until recently there has been no mandatory national reporting system for occupational injuries and illnesses, and the few State reporting systems in existence are incomplete and nonuniform.

Total deaths annually from job-related injuries have been placed at over 14,000, with an estimated 2.2 million disabling injuries. The National Health Survey conducted by the Health Services and Mental Health Administration's National Center for Health Statistics has estimated that the average worker experiences 6 days of absence and more than 16 days of restricted activity due to some type of job-related disability per year. On the average one out of eight workers will sustain a job-related injury each year. Ten times as many man-days are lost from job-related disabilities as from strikes.

The incidence of occupational disease is less well known, but recent estimates indicate at least 390,000 new cases of disabling occupational disease each year. Based on limited analysis of violent/non-violent mortality in several industries (see Table 5–1) there may be as many as 100,000 deaths per year from occupationally caused diseases. Health deterioration at the workplace results from a variety of hazards and manifests itself in a variety of forms. These range from the overt, classic, occupational diseases such as lead and mercury poisoning, to the insidious, delayed effects of exposures to noise that cause partial or total hearing loss and to dusts that produce fibrosis of the lungs. Even beyond these effects, there are the considerations that exposures to some occupational hazards will cause, promote, or contribute to the development of cancer, hasten the onset of certain degenerative diseases, or shorten the life span.

### TOXIC SUBSTANCES

A toxic substance has been defined as one which demonstrates the potential to induce cancer, to produce long term disease or bodily injury, to affect health adversely, to produce acute discomfort, or to endanger life of man or animal resulting from exposure via the respiratory tract, skin, eye, mouth, or other routes in quantities which are reasonable for experimental animals or which have been reported to have produced adverse effects in man. The need for a list of toxic substances is recognized in the Act with the requirements of section 20(a)(6) that the Secretary of HEW shall publish within 6 months of enactment of the Act and thereafter as needed, but at least annually, a list of all known toxic substances by generic family or other useful grouping, and the concentrations at which such toxicity is known to occur.

NIOSH has met this requirement with the publication of *Toxic Substances—Annual List 1971.* This publication is available from the U.S. Government Printing Office, Washington, D.C. for $3.75. Approximately 8,000 substances were included in this first list.

For the purposes of the list, a toxic substance was defined, exclusive of radioactive chemicals producing noxious effects due to radioactivity, to include all mined, manufactured or synthesized inorganic and organic substances, including drugs, food additives, and pesticides, as well as refined

substances of natural origin. The listed substances were presumed to be pure; the reported toxic effects have been attributed solely to the items as described in the original source. Excluded from the list, therefore, were unpurified extracts of natural substances and commercially formulated products.

The list provides a convenient reference source for potentially hazardous materials and serves as a guide for research needed in setting new occupational health standards. Currently available standards limit exposure to the more common chemicals—those used most frequently by the most people, and those which may be the most toxic. However, a great many chemicals not covered by the standards are in use in small amounts by isolated groups; the effects of these infrequently used chemicals on man are not widely known.

New chemicals are being developed at the rate of several thousand a year with 500–600 of these finding their way into industrial usage. The next annual list of toxic substances will contain many more entries, especially carcinogens and neoplastic agents, and will provide more information about each substance. As the list gives the concentration at which each substance is known to be definitely toxic, it is most certainly not a list of safe exposure limits. Rather, it should be considered as a "shopping list" for research into developing future criteria for standards.

## Chapter 3

# SURVEILLANCE AND PRIORITIES DEVELOPMENT

With the implementation of the Act there has developed a growing awareness of the need for basic information concerning occupational illness and injuries—particularly as it relates to the scope and severity of the problem. The government research and enforcement programs to protect the American working population from health and safety hazards must consider an incredibly complex array of millions of workers distributed over millions of workplaces and engaged in thousands of different types of activities. These programs must include as one of their most important management and scientific tools, accurate descriptions and analyses of the population which they are to protect and the conditions which they must control. Basic questions to be answered include: when, where, and how many people are becoming ill or injured; what are the causes of the illness or injury; how many people are exposed to what types of hazards; where are they located; in what industries can they be found; what industries have health and/or safety programs; are these programs effective? This information must be available if government and private programs are to direct their efforts effectively.

To begin to answer many of these questions, NIOSH has undertaken surveillance activities designed to identify and define the potential for occupational health problems (Hazard Surveillance) and to measure the magnitude and extent of these problems as manifested by existing or recorded illnesses and deaths (Illness and Injury Surveillance). Although this information will not, with complete accuracy, define the total occupational health problem in this country, it will be a primary input towards establishing research priorities and influencing future activities in the field of occupational safety and health.

## HAZARD SURVEILLANCE

Since no adequate information exists which reflects a representative cross-section of in-plant environmental conditions, NIOSH has undertaken a controlled sample survey (beginning in mid-January 1972) to acquire the necessary data. Plans for the National Occupational Hazard Survey were begun in late spring 1971. This survey will be a two-year study which will develop basic descriptive information on the working environment in all non-farm industries covered under the Act. This information will be used to assist in setting priorities for research and compliance, for directing research teams in future investigation efforts, for measuring and to some extent forecasting trends, and for developing guides which will describe the potential health hazards which are typically associated with a given industry or occupation.

In order to accomplish this task, specially trained NIOSH engineers will survey a representative sample of plants. The survey is of a research nature and is not intended to be used for enforcement purposes. The survey will consist of an on-site visit to each plant in the sample at which time an interview of the plant manager or other qualified representative will be conducted, the answers from which will be recorded on Part I of the Survey Form. (See Appendix D for Survey Form.) The plant summaries of illness and injury (Occupational Safety and Health Administration form number 102) will be recorded and a walk-through made of the plant operations in order to enumerate the types of potential hazards and the persons exposed to these hazards. The NIOSH surveyors have been trained to comprehensively categorize and record their observations made during the walk-through phase of the survey. These

observations are categorized on Part II of the Survey Form under the following titles:

1. Number of Employees—Indicating the exact number of employees who are exposed.

2. Employee Group Title—A two- or three-word description of the job title of those exposed.

3. Potential Exposure—The exact name of the chemical substance or physical agent causing the exposure (e.g. carbon monoxide, trichloroethylene, continuous noise, etc.).

4. Form—Indicating the physical form in which the chemical substance is found (e.g. dust, vapor, mist, etc.).

5. Duration—Indicating a difference between full-time and part-time exposure.

6. Intended Control—Indicating the intended control which has been applied to offset a possible hazardous exposure and whether that control is functioning or not (e.g. general dilution ventilation, isolation, personal protective equipment, etc.).

The sample of workplaces has been designed and selected in cooperation with the Bureau of Labor Statistics, U.S. Department of Labor. It is composed of approximately 5,200 establishments from 67 Standard Metropolitan Statistical Areas (SMSA's) and 3,000 from non-SMSA areas. The sample has been stratified by industry-type using Standard Industrial Classifications (SIC's) and by plant size. Establishments with less than eight employees were not included in the study thereby eliminating approximately 70 percent of the establishments but only 12 percent of total employment covered under the Act.

As the data are collected, they will be sent to NIOSH Headquarters. Here the data will be transcribed and fed into a computer which will make initial edits and tabulations. The data then will be stored on magnetic tape for future processing. When the survey is complete in 1974, NIOSH will have a detailed, reliable description of the in-plant environmental conditions for the bulk of the American working population on an industry, job, and exposure specific basis. The data will be held in a computerized information file which will permit swift and easy access to the many program areas that require the use of such information.

In a study of this type, the professional capability of the surveyor in recognizing potential hazards is critical; therefore, in the summer of 1971, NIOSH developed (via contract) an extensive surveyor training and evaluation program. The training program consisted of a 9-week comprehensive formal classroom presentation in the fundamentals of industrial hygiene and occupational health. Following this phase of the program, the surveyors experienced actual workplace situations in the company of professional industrial hygienists from the Pennsylvania Division of Occupational Health. This on-the-job training was integrated into Pennsylvania's regular industrial hygiene inspection program which uses an information recording system developed by NIOSH several years ago and which closely resembles that used in the study. Throughout this phase of the training, both subjective and objective evaluations were made of the trainees by the professional hygienists. Additional surveyor evaluations will be undertaken throughout the course of the survey.

An extensive and specific set of survey guidelines has been developed. These guidelines provide exact instructions regarding virtually every level of detail of the survey operations. These guidelines coupled with the method NIOSH has used to train the surveyors will insure uniform performance in recognizing, classifying, and recording potential occupational exposures. This approach is necessary to develop information of the required degree of accuracy and reliability.

NIOSH has also continued its activities under the National Surveillance Network. This program was devised to assist the States in those activities directed toward identifying specific industrial health problems. For the States, the Network provides a proven field-tested recording and data processing system for large quantities of valuable information regarding potential occupational health problems. The National Surveillance Network is similar to the National Occupational Hazard Survey in that it affords a detailed and standardized procedure for recording in-plant environmental conditions. For NIOSH this system produces information which augments that of the National Survey, but which for various reasons cannot stand alone for national estimates. Among the more important of these are the following: (1) the States enter the system on a voluntary basis at times which suit their needs; (2) the industrial hygiene techniques and inspection requirements are not standard between States; (3) the procedure is modified to meet the particular needs,

funds, and available personnel of the State; and (4) the necessary resources to conduct survey operations to the degree of detail required in the National Survey are not generally available at the State level. The states of Georgia, Kentucky, Oregon, and Pennsylvania are now full participating members of the National Surveillance Network.

## ILLNESS AND INJURY SURVEILLANCE

The objective of the Illness and Injury Surveillance Program of NIOSH is to define the magnitude and distribution of the incidence of occupational illnesses and injuries in the workforce. To accomplish this goal, NIOSH will rely almost entirely on the injury statistics developed by the Department of Labor through the employer reported injury and illness data. In the area of illness statistics, however, under reporting can be expected initially because of under-recognition of occupational diseases, non-specificity of symptoms, and failure to suspect a relationship with the working environment. Therefore, NIOSH's efforts are designed to validate and supplement these Department of Labor statistics through a coordinated approach.

This objective is accomplished through the following procedures: (1) review of existing vital statistics and other data sources on occupational health; (2) retrieval and review of disease and population data from industry, labor unions, and other government agencies; and (3) provision of special services to outside investigators to stimulate additional studies of occupational disease. In addition, NIOSH has entered into special studies to develop and pretest a medical questionnaire to elicit health information which may be related to environmental exposures and medical examination findings and to conduct comparability studies of existing mandatory occupational disease reporting systems. Both of these studies are well underway toward producing this necessary and useful information. Significant activities in these areas during the past year include the following:

1. A review of the literature on the relationship between benzene exposure and consequent leukemia suggested that printing pressmen might be at excess risk as a result of heavy benzene exposure, and disability data published by the Social Security Administration suggested higher rates of disability from leukemia and lymphoma among men in certain printing trades as compared to all disabled workers. Through the cooperation of the International Printing Pressmen and Assistants' Union, mortality records have been gathered for a more detailed analysis.

2. U.S. mortality data have shown that heavy construction machinery operators experience an excessive death rate from on-the-job accidents and that stationary engineers have a significant excess of cancer mortality, primarily of the respiratory system. Arrangements have been made with the International Union of Operating Engineers, which includes both occupational groups in its membership, to recover death certificates for a more detailed analysis.

3. Both U.S. mortality data and Social Security Administration disability data indicate that men employed in foundry operations have experienced excess mortality from malignant and nonmalignant respiratory disease. Furthermore, the United Auto Workers Union has requested a survey of automobile foundry workers thought to be at excess risk of death. With the cooperation of the Union and the three major automobile manufacturers, arrangements are being made to study the mortality experience of gray iron foundry workers in the Michigan area in terms of relative frequencies of specific causes of death.

4. British and American mortality data show that dentists have a relatively high rate of suicide, and data from several sources suggest an excess of leukemia and certain neurological diseases among members of this profession. These findings are of particular interest because of the recognized long-term, low-level exposure of this population to mercury and X-radiation. Preliminary planning for a large scale study of mortality in American dentists is being undertaken in collaboration with one of the major schools of dentistry.

Several broad-based bodies of data relating mortality and disability from specific causes to occupation and/or industry are available as reference sources for identifying occupational groups experiencing unusual risks of disease, thereby aiding in the development of priorities for occupational health research. The inherent value of these data is seen in the British reports, for example, where several instances of an excess disease risk

associated with occupation have been confirmed by subsequent epidemiological studies. Indications of unusual lung cancer experience in a number of occupational groups have been substantiated by independent investigations utilizing various methods of study.

Present plans call for full exploitation of material contained in these publications by utilizing them as an initial screening device, whereby particular occupational groups exhibiting unusual patterns of disease would be scheduled for further evaluation by relevant epidemiologic methods. Rapid retrieval in response to specific queries will be accomplished through creation of computerized data files consisting of the complete contents of each reference source. Examples of specific questions to which quick answers could be obtained from this system are the following: (1) given a particular occupation or industry, does the pattern of cause-specific mortality and/or disability exhibited by individuals so employed suggest a possible health hazard in the working environment; and (2) given a particular disease, what occupations and/or industries seem to exhibit an unusual mortality or disability rate for this condition? Response to the latter query would provide feedback to the activities of the hazard surveillance staff as potential areas for in-depth industrial hygiene surveys.

Future NIOSH illness and injury surveillance activities include review and assessment of the results of the Department of Labor nationwide surveys of occupational illnesses and injuries by industry and establishment as a further method of identifying unusual health patterns among workers in the United States. Data on work-related illnesses and injuries gathered by certain states (such as California) will be utilized to judge the comparability of these reporting systems. In time, it is hoped that in-depth studies of the detailed information contained in the record-keeping forms distributed by the Department of Labor will be undertaken to further elucidate etiologic relationships in disease and injuries associated with the working environment.

The recovery, analysis, and evaluation of data bearing on potential occupational health problems require input from a variety of scientific disciplines, many of which are in short supply, both within NIOSH and extramurally. With few exceptions research groups are unable to recruit persons trained in skills such as nosology (classification of diseases) and the tracing of industrial populations over long time periods. Therefore, to fully utilize the skills of the small number of investigators in the field of occupational health epidemiology, NIOSH provides support in these activities. In addition to support of numerous studies within NIOSH, nosological service has been provided during the past year to outside investigators studying steelworkers, asbestos workers, nickel workers, and rubber workers.

Provision of nosological and follow-up services to outside investigators should significantly increase the number of epidemiological studies of occupational disease in future years.

## PRIORITIES DEVELOPMENT

NIOSH has established a staff function charged with the primary task of incorporating the illness and injury surveillance and hazard surveillance data into a meaningful system for determining research priorities. In addition, this unit also has a primary function to identify, develop, and maintain additional data systems where necessary and to develop quantitative procedures for assigning priority levels to problem areas.

In 1971, the activities of this unit were concentrated on the establishment of information channels and on the exchange of ideas with interested and concerned parties in both private and public sectors charged with the implementation of control or surveillance activities. A continuing dialogue and exchange of information has been developed with the Occupational Safety and Health Administration and the Bureau of Labor Statistics of the Department of Labor. New sources of existing pertinent data have been explored and in 1972 new techniques for priority setting will be explored.

NIOSH has published a *Priority List for Toxic Substances and Physical Agents* (see Appendix E). This list was prepared utilizing a technique which essentially establishes a rating based upon a linear relationship of the following variables:

—Population index—a relative evaluation of the number of workers exposed.

—Relative toxicity index—professional opinion of relative toxicity.

—Incidence index—documented incidence of diseases from occupational disease records, physician's first reports of work injury, workmen's compensation records.

—Quantity index—amount produced or used each year.

—Trend index—estimates on increased or decreased usage.

A number of these variables are from consensus polls of recognized experts in the field of occupational health but, where possible, the input was quantified. For the most part, the data utilized in this quantification were obtained through NIOSH surveillance activities.

The Priority List is divided into three main parts. First, a list of those toxic substances and physical agents for which criteria for recommendation of a standard has been developed is presented. Second, the "in progress" part includes those substances and physical agents for which criteria documents have been initiated. Finally, the "priorities" part presents 19 groups of toxic substances and/or physical agents whose relative priority has been established by the above mentioned system. No attempt has been made to evaluate the relative priority of the elements within each group. The substances and physical agents within each group are considered as having equal priority and are presented in alphabetic order.

At the present time, health and safety are being developed as two separate areas in priority development. It was thought that this approach is best in that, presently, expertise in NIOSH is primarily in the health field. Consequently, the health priority system and approach has begun within NIOSH, while a priority system for the relative evaluation of occupational safety hazards is being developed under contract. A research review of safety hazards has been completed, and the first draft of a technique for review has been submitted to NIOSH. If feasible, the health and safety priority systems will be merged into one system when it is felt that a desired level of sophistication is reached in both.

## Chapter 4

# DEVELOPMENT OF CRITERIA FOR RECOMMENDATION OF STANDARDS

### PROCEDURE

Section 20(a)(3) of the Act stipulates that the Secretary of HEW shall develop criteria dealing with toxic materials and harmful physical agents and substances which will describe exposure levels that are safe for various periods of employment, including but not limited to exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience. Such criteria are to be developed to enable the Secretary of Labor to meet his responsibilities for promulgating standards under the Act.

NIOSH develops criteria for toxic materials and harmful physical agents and substances for recommendation to the Secretary of Labor in the form of a criteria document. The criteria document includes a critical evaluation of all known prior research and knowledge on the particular material or agent and a recommended standard based on this evaluation (see Appendix F for criteria document format).

The criteria document defines hazardous materials, with standards for exposure to these materials, including labeling/warning specifications, symptomatology/diagnostic aids, and precautionary measures. The criteria document may also include recommended personal protective equipment, engineering control, safety requirements, environmental monitoring, medical monitoring examinations, record-keeping requirements, fire protection specifications, pollution/waste disposal requirements, and transportation/storage recommendations about each chemical and physical agent.

The priority list described in the previous chapter serves as the primary input in the process of deciding in what order criteria documents will be developed. Other input in the decision process are the factors of projected cost and time. In order for a criteria document to be written, current knowledge on the particular material or agent must be adequate and complete. If not, a research program is initiated to fill in the research gaps and the criteria document is written when the research findings are definitive enough. A particular hazard may be very high on the priority list but may also require much more research before the criteria document can be written. Similarly, another hazard may be somewhat removed from the top of the list but may require only a literature search which can be accomplished at low cost and within a relatively short time. All of these factors are considered in determining the order for developing criteria documents.

The development of a criteria document is a large undertaking. The first task of searching for and reviewing all past literature on the subject is in itself a formidable task. Currently, criteria documents for beryllium, cotton dust, carbon monoxide, lead, mercury, heat stress, noise, ultraviolet light, and sanitation are in various developmental stages. These documents are expected to be completed in 1972. In addition, criteria documents are being planned for benzene, cadmium, chromic acid, fibrous glass, and parathion. During 1971, 25 additional materials and agents were under review for availability of data necessary for the preparation of criteria for the recommendation of standards.

A general review procedure has been established for criteria documents. Once a first draft of a



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criteria document has been developed, it is reviewed for completeness and accuracy by a committee of NIOSH staff. The recommendations of this committee are included in the second draft of the document which is then reviewed again by the NIOSH committee as well as a committee of outside consultants. The comments of this review are included in a third draft of the document which is then given a final NIOSH review before the final criteria document is writtten. Currently, this review procedure is being studied, and changes may be made which reflect the experience gained in developing the first several criteria documents.

## EMERGENCY STANDARD

Under section 6(c)(1) of the Act, the Secretary of Labor is required to provide for an emergency temporary standard (to take effect immediately upon publication in the *Federal Register*) if he determines that employees are exposed to grave danger from exposure to substances or agents determined to be toxic or physically harmful or from new hazards and that such emergency standard is necessary to protect employees from such danger. During 1971, the Secretary of Labor set a temporary emergency standard for asbestos exposure following a recommendation from NIOSH. This standard was 5 asbestos fibers per cubic centimeter (cc) of air based on a count of fibers greater than 5 micrometers in length determined as a time-weighted average exposure for an 8-hour workday and reflected the change in the American Conference of Governmental Industrial Hygienists' Threshold Limit Value intended to go into effect in 1972.

At the end of 1971, NIOSH finalized an Asbestos Criteria Document for transmittal to the Secretary of Labor to aid him in setting a final asbestos standard. The criteria for this asbestos standard were developed to assure that the standard would, (1) protect against asbestosis and asbestos-induced neoplasms; (2) be measurable by techniques that are valid, reproducible, and available to industry and official agencies; and (3) be attainable with existing technology.

The recommended asbestos standard suggests occupational exposure limits effective 2 years hence, expressed as a time-weighted average (2 fibers/cc) and as a ceiling value (10 fibers/cc). It also provides for environmental monitoring, medical examinations, protective clothing, and respiratory protective devices.

# Chapter 5

# RESEARCH

Sections 20 and 22 of the Act place the responsibility for conducting occupational safety and health research with the Secretary of HEW and with the Director of NIOSH. To meet this responsibility, NIOSH has established research programs within the areas of toxicology, physical and chemical analysis, physiology and ergonomics, engineering, psychology, physical agents, and epidemiology.

NIOSH has undertaken an applied rather than a basic research program because of the nature of the requirements of the Act. Most NIOSH research is directed in some way toward the development or modification of criteria which are used for recommending health or safety standards.

NIOSH conducts its research program through in-house projects, grants, contracts, agreements with other Federal agencies, and through special foreign currency arrangements with foreign countries (Public Law 83–480). Appendices G through J contain all 1971 active NIOSH contracts, grants, interagency agreements, and special foreign currency arrangements.

## TOXICOLOGY

In 1971, NIOSH toxicology research was reorganized and expanded in order to comply with the new demands placed upon it by the provisions of the Act. This entailed the following activities: (1) creation of a new laboratory for evaluation of toxic hazards of industrial substances in order to respond to requests from employers or employee representatives as specified in section 20(a)(6) of the Act; (2) the expansion of the biochemical services unit to supply data to the evaluation laboratory and other divisions of NIOSH by rapid, automated methods; and (3) broadening of the goals and the staff of the pathology section to provide a central repository for industrial disease cases for the training of industrial physicians, to assist other physicians in the diagnosis of industrial disease, and to assist NIOSH investigators in evaluating the toxicity of industrial chemicals.

With regard to criteria for an oil mists exposure standard, four important long-term animal studies which began in 1962 were completed. The studies, which were designed to develop criteria for four typical cutting oils in worldwide use, indicate that the current standard had a health effects safety factor of possibly tenfold. In addition, no evidence of pulmonary carcinogenic effects was found for any of the oils studied.

The aim of another project was to validate the tentative occupational exposure limit for subtilisins (enzymes used in laundry detergents). An important concomitant result was the finding that the primary action of subtilisins is that of a histamine-releasing agent in the respiratory tract, leading to broncho-constriction. This problem was found to be preventable by prior administration of antihistaminics or, if present, could be relieved by combined treatment with a broncho-dilator and antihistaminics.

In attempts to find the long-sought mechanism by which latent chronic beryllium disease occurs many years after exposure has ceased, NIOSH toxicology researchers developed the hypothesis that adrenal imbalance is the triggering mechanism. Further experimental work may eventually confirm this hypothesis as indicated by the following findings: (1) removal of the adrenals increased beryllium toxicity by causing a systemic redistribution of deposited beryllium to more susceptible sites; (2) adrenal imbalance by chemical

means resulted in more pronounced systemic disease; and (3) pregnancy superimposed on beryllium exposure caused more severe beryllium response than in nonpregnant animals, as evidenced by an increasing number of lesions in lungs and kidneys.

Chronic studies in animals on the pathologic effects of beryllium alloys and intermetallics used in metallurgy have demonstrated wide ranges of responses, depending on the chemical composition of the compound tested. Some compounds, such as beryllium boride, produce much greater effects, and some compounds, such as beryllium, copper and tantalum beryllide, produce lesser effects than beryllium metal. Transplantable lung tumors have been produced with beryllium metal, chromium coated beryllium metal and beryllium aluminum. The smallest dose of beryllium which will produce lung cancer in rats is 40 micrograms, when it is given as beryllium hydroxide. This is the smallest dose of any tested inorganic chemical which will produce lung cancer in rats.

Long-term studies (20 months) on rats have shown that a mercury compound inhibits the lethal effects of selenium compounds when they are administered together in the drinking water. This research demonstrates the need for studying the interactions of toxic chemicals.

The pyrolysis products of various plastic materials are of concern to firemen and other workers where toxic fumes may provide a menace to their health. The fluorocarbons have been examined because of the potential release of extremely toxic fluorine compounds such as carbonyl fluoride. Based on NIOSH research, some manufacturers have changed product formulations of the fluorine plastics in such a way as to eliminate the carbonyl fluoride as a product of combustion. The decomposition by pyrolysis still generates compounds such as carbon monoxide, hydrogen fluoride and formaldehyde.

In the field of foam plastics, industrial exposure to isocyanates was found to result in an immunologic reaction producing delayed and allergic types of hypersensitivity predictably occurring in about 1 percent of the U.S. worker population.

To explore the role of natural bacterial flora of the lung in the development of dust diseases of that organ, bacteria-free animals were exposed to quartz dust. The results obtained, in comparison to animals with natural flora, did not indicate that bacterial flora of the lung contribute significantly to pulmonary fibrosis from quartz exposure.

NIOSH toxicology research indicated that the trace metals of nickel and chromium in asbestos are the active agents leading to lung cancer in experimental animals and that certain metallic elements can prevent their action. Based on this research it may be possible to coat asbestos, thus preventing or reducing the neoplastic effects of asbestos exposure.

Other research investigations have not yet yielded definitive, reportable findings either because of recent initiation or their preliminary or minor nature. Such projects include identification of substances associated with byssinosis (cotton dust disease), detection of early changes in asbestosis, toxicologic evaluation of certain manganese ores and silica flour dust of foundaries, role of environmental factors on trace element metabolism, biophysical studies on the adsorptive properties of small particle surfaces, and pathogenic mechanisms of industrial disease.

## PHYSICAL AND CHEMICAL ANALYSIS

The objective of NIOSH physical and chemical analysis research is to develop, improve, and evaluate analytical methods and instruments for the determinations of the levels of toxic materials, their products and other significant substances found in the workplace. In order to accomplish this objective, several projects for the development of analytical methods were initiated.

Analytical methods development and testing was begun, both in-house and by contract, for compounds and materials for which criteria documents are to be prepared in the next 2 years. This includes such materials as lead, asbestos, cotton dust, beryllium, carbon monoxide, mercury and silica. An interagency agreement with the Atomic Energy Commission's laboratory in Los Alamos, New Mexico, has been negotiated to collaboratively test the sampling and analytical techniques for determining elemental, organic and particulate mercury.

A project was started to develop means to sample gases and organic vapors, for subsequent shipment to an analysis at the laboratory. This would enable field personnel to sample the ambient air for these toxic substances utilizing solid absorption systems which lend themselves to easy trans-

port by regular commercial or postal means. In order to expedite this effort, an interagency agreement with the Atomic Energy Commission has been negotiated. At Los Alamos they will work at developing new sampling and analytical methods with emphasis on the use of a variety of solid absorbents for both gases and organic vapors.

In conjunction with NIOSH industrial hygienists, a study is under way to investigate the effect of environmental variables on the collection and measurement of several organic vapors using activated charcoal as the sampling media.

By contract, an evaluation is being made on newly developed analytical instrumentation and how it can be applied to the solving of occupational health problems. Two such instrument techniques under investigation are electron spectroscopy and spark source mass spectrometry.

The investigation of meaningful sampling and analytical techniques to be used in the evaluation of coal tar pitch volatiles is being conducted primarily through the contract mechanism. In cooperation with the American Iron and Steel Institute (AISI), a survey of five coking installations has been initiated. The objectives of this study are to evaluate sampling and analytical methods and to develop background data on exposure levels. The samples collected on this survey are being analyzed under contract. Approximately 1,440 samples are being obtained through the joint survey of five coking operations. These samples are being analyzed by the following analytical methods: (1) determination of benzene soluble fraction; (2) the gas chromatographic separation of 14 polynuclear aromatic hydrocarbons; (3) thin-layer chromatography for benzo(a)pyrene; (4) the liquid column chromatographic separation of 10 polynuclear aromatic hydrocarbons; (5) fluorimetric index; (6) atomic absorption for trace metals; (7) gas chromatographic procedures for samples of solvent vapors on charcoal tubes.

Contractors were requested to perform a complete literature search. To date, approximately 2,000 abstracts on the sampling, analytical, medical and production aspects of this substance have been received and reviewed. An emission spectral index of some 30 polynuclear aromatic and heterocyclic compounds found in coal tar pitch is being compiled. It is hoped that a photodynamic assay technique can be developed for those compounds exhibiting carcinogenesis.

The increased industrial use of plastic materials of all types makes it imperative that as much as possible be known about the pyrolysis products of the in-process and finished materials. The investigation of various types of commercial plastics such as reinforced plastics, polycarbonates, urethane backed plastics and filler plastics will be conducted utilizing the mass spectrometer in conjunction with the thermal gravimetric analyzer, microcombustion furnace and the gas chromatograph in order to determine the pyrolysis profile, the pyrolysis products of each type of plastic and to assist in the evaluation of the toxicity of these pyrolysis products.

## PHYSIOLOGY AND ERGONOMICS

The NIOSH physiology and ergonomics research program is directed at developing criteria for recommendation of standards for certain physical stresses and/or combinations of physical and chemical agents detrimental to the health and safety of the worker. Within this general program objective, specific projects have been initiated.

During 1970, NIOSH developed a simplified method for setting, interpreting, and monitoring permissible exposure limits to heat stress which was adopted by the American Conference of Governmental Industrial Hygienists in 1971.

In 1971 a primary research effort was directed toward further simplification of the required heat stress techniques for monitoring climatic conditions at work places and for assessing the metabolically generated heat caused by physical work.

One important project involved collecting data to strengthen the background upon which permissible exposure limits can be based. In laboratory studies, measurements were made of the contribution of metabolically generated heat and of environmental heat to the total cardiovascular load in men working in a hot environment. Metabolic heat produced a greater cardiovascular stress than did equal increments of environmental heat. In field studies, researchers measured the heat exposure and physiological responses of workers in three different industries. The methodology applied in these studies was coordinated and standardized with several academic and industrial research teams who also conducted such studies in different factories. The standardization of the technique will facilitate pooling of all data col-

lected by the different teams, thus obtaining a broader basis for heat stress standards.

Negative water balance has long been known to reduce man's ability to deal with heat stress. NIOSH has investigated the effect of hypohydration on heat acclimatization itself. Subjects were exposed to alternating 20-minute periods of treadmill exercise and rest in a temperature controlled environment. Exposures were scheduled for 4 hours on 5 consecutive days with two groups of four healthy college-age males serving as volunteer subjects. During the last 4 days, one group received water equal to weight loss after each work/rest cycle; the second group was denied water. Both groups showed improvements in physiologic function associated with heat acclimatization, though the hypohydration group suffered greater strain (higher heart rate and higher deep body temperature). On the fifth day, however, when all eight men received water, both groups evidenced similar levels of acclimatization. These data indicate that acclimatization may be achieved equally well in the absence of water during heat exposure.

The interaction of carbon monoxide and heat stress was studied under control conditions. It appears that 100 parts per million carbon monoxide for 4 hours does not result in physiological strain in healthy men or women, but that carbon monoxide and heat together represent a minor strain in men and a marked strain in women for this length of exposure.

A research project was begun with the aim of finding simple biochemical, physiological, and psychological tests which can be used to establish whether the sum of stresses imposed upon a worker by his job is excessive and therefore potentially harmful to his health. A test battery was developed in 1971; tests will be conducted in 1972.

A study was initiated to determine the extent to which the static component in physical work is responsible for job fatigue. Static effort is an inevitable component of any activity, if only to maintain an upright posture or hold up the head against gravity. Some activities such as carrying or shovelling have a high static component. It is known that recovery from rhythmic activity is rapid while recovery from static effort is slow and the effects are cumulative. Blood pressure and heart rate response to static work are much more dramatic than for rhythmic work. It would be expected that the physiological strain in rhythmic work with a high static component would therefore be greater than from a purely rhythmic work at equal levels of energy expenditure. If this proves to be the case, the criteria now used for permissible work levels in industry would require reconsideration. Data collection of this controlled laboratory study started during the last quarter of 1971.

Another study involved conducting static and dynamic pulmonary function testing on 140 workers at an asbestos plant in New Hampshire. The test battery included forced vital capacity, forced expiratory volume at one second, residual volume, total lung capacity, and carbon dioxide lung diffusion capacity at rest and during work. With this stand, the survey of pulmonary function in asbestos workers was completed. The date for each of the 2,115 asbestos workers included in the total pulmonary function survey have been processed and calculated and the information has been punched on data summary cards in a form for use in the many statistical analyses and comparisons that will be made. Each individual's pulmonary function in the asbestos survey will be compared with standard pulmonary function values and with occupational, medical, and X-ray data to establish deviations from normal and their relationships to the work and work environment.

## ENGINEERING

The NIOSH engineering research and development program has the objective of developing instrumentation, techniques, and criteria for the determination of, and protection from contaminants present in an industrial environment.

The development of particulate sampling instruments and techniques is an important NIOSH engineering program. A monodisperse aerosol facility was developed for testing size-selective samplers, and a study has been made of the effects of pulsating flow on the performance of the 10-mm nylon cyclone. Some unusual problems encountered in the sampling of cotton dust were solved by the development of a vertical elutriator which is now commercially available. Field sampling of dusts and fumes was conducted at various industrial plants for further development of sampling methods and criteria.

Work on particulate sampling is also being performed under five different contracts. These contracts call for the development of standard test

dusts, dispersal methods and a dust chamber design, the development of several new particulate sampling instruments, and the critical evaluation of presently available equipment.

The development of gas and vapor sampling instruments and techniques is also an important NIOSH engineering program. Equipment for setting up known concentrations of various gaseous contaminants has been designed, and five of the systems have been constructed to serve the various projects now underway. These projects include:

1. Development of sampling and analytical methods for gaseous air contaminants.

2. Establishment of specific sampling procedures for each air contaminant.

3. Determination of sampling equipment suitable for use in the field as personal samplers.

4. Evaluation of the accuracy and practicability of possible sampling and analytical methods for various contaminants.

5. Testing and evaluation of gas detector tubes.

6. Testing and certification of detector tubes for use by Department of Labor inspectors.

7. Tests of charcoal tubes for sampling solvent and mercury vapors.

A pump suitable for taking a continuous 8-hour sample with a carbon tube is being developed under contract.

Ventilation is widely used in the control of air contaminants and heat in the industrial environment. NIOSH is therefore interested in the development of new concept design criteria such as high velocity-low volume and push-pull systems as they relate to function and make-up air supplies. Various types of industrial ventilation systems and instrumentation for determining system performances need to be reevaluated. Work has been done on the development of instrumentation for rapidly assessing the performance of existing industrial ventilation systems.

Field studies were conducted at the Federal Penitentiary in Atlanta on the control of cotton dusts in a cotton processing plant and on the performance of various filter media in the removal of cotton dust.

Work is also being done under three separate contracts on the development of criteria for the design of open surface tank exhaust systems, the determination of pressure losses at inlet fittings in exhaust ventilation systems, and the development of an air purifying unit.

Studies of heat stress in hot industries require an accurate assessment of the environmental conditions to which the workmen are exposed. NIOSH is therefore interested in the development of instrumentation and techniques to be used in measuring these conditions.

During the past year some work has been done on the redesign of the Envirec, an instrument development by NIOSH which provides a continuous recording of dry-bulb, wet bulb, and globe temperatures. NIOSH engineers have also participated in heat stress studies in industrial plants. Development work is being done on environmental instruments under two different contracts and a critical evaluation of the globe thermometer is being made under a third contract.

To assure that respiratory protective devices meet minimum standards to protect the health and safety of the worker, NIOSH is engaged in a research program to develop criteria for the improvement of these devices.

Equipment for a comprehensive testing and evaluation program on respirators is being assembled. NIOSH engineers have also participated in the preparation of a new respirator testing and approval regulation, and in a new American National Standard Institute standard covering procedures for respiratory protection against coal dust. Improved standard test aerosols and more valid methods of testing respirators are being developed through an interagency agreement with the Atomic Energy Commission.

Development and evaluation studies relating to specific respirator applications are in progress under three separate contracts, including a contract for the development of anthropometric specifications to be used in establishing respirator sizing requirements. In addition, contracts have been awarded for the development and construction of a breathing simulator, and a study of the chemical and physical stresses to which fire fighters are exposed.

## PSYCHOLOGY

Sections 20(a)(1) and (4) of the Act state the need to include psychological, behavioral, and motivational factors in researching problems of

occupational safety and health and in considering these factors in developing new techniques in handling worker safety and health matters. Sections 20(a)(3) and (7) imply consideration of losses in behavioral functions and undue stress in hazard evaluations of the work environment and job conditions. A research program to meet these provisions was formulated by NIOSH.

One part of a project to explore psychological and motivational strategies involves: (a) preparation of a model accident control plan for industry based on known psychological principles; and (b) tailoring applications of the model plan, including details of the actual implementation, to three high-accident industries. Field evaluations of these schemes is subsequently envisioned.

A second part of this overall project will be to examine, via questionnaire surveys and in-depth interviews, attitudinal and motivational factors in miners which affect their acceptance of established safety measures or preventive health practices. Characterization of the safety consciousness of miners in mines with high and low accident rates will be a part of this effort. This work is to be handled via contracts to be awarded in 1972.

Another project dealing with job demands and worker health seeks to determine whether certain job situations imposing extreme demands on workers, apart from exposures to physical or chemical hazards, can be associated with physical and mental health problems. As a first investigation, entries in medical, safety, attendance, and job proficiency records, augmented by interview and psychological test data, will be evaluated for persons engaged in work demanding rapid intake and processing of masses of information, complex and quick decision-making having consequences to personal or group security, adherence to machine-paced schedules, unnatural work-rest regimens, etc. Attempts will be made to correlate perceived stress of such jobs against evidence of stress-related physical or mental disorders as found in the workers under study. This study will be done by contract. In addition, some in-house study of certain groups subjected to psychological stress on their jobs (such as aircraft control operators and police) will commence in 1972.

Assessment of behavioral disruptions and functional losses caused by acute and chronic exposures to physical and chemical agents in industry is the subject of another project. On-going contracts in this area include: (a) an evaluation of losses in psycho-motor performance and neuromuscular changes in workers having long-term exposures to methyl mercury, and (b) a comparison of medical, accident, and absenteeism data on workers in noisy versus quiet jobs. Other activities to be carried out include laboratory or field tests involving exposures to chemical agents on performance functions and neurophysiologic measures. This work will be handled in-house and by contract as will activity on related projects aimed at developing a performance battery with key performance indicators for early detection and monitoring of potential workplace hazards involving physical or chemical agents.

Additional contract work has been planned with regard to assessing noise effects on nonauditory sensory functions and implications for worker safety. Also, a critical literature review will be prepared to clarify the significance of individual difference factors, both physical and psychological, in influencing the capacity to perform safely and to cope with adverse work conditions or otherwise account for differential accident and health problems among those who hold hazardous or stressful jobs.

Other contract and in-house activities directly or indirectly related to the psychological program area include an evaluation of the after-effects of acute alcoholic intoxication on measures of perceptual-motor performance, a study of subjective and physiologic reaction to noise differing in perceived quality and meaning, and an evaluation of chlorpromazine effects on temporal discrimination.

## PHYSICAL AGENTS

Physical agents research is both laboratory and field oriented. Support of the NIOSH mission has been directed toward three principle physical agents; noise, vibration and electromagnetic radiation.

During 1971, occupational noise and hearing surveys were done in the printing industry (880 subjects), tunnel policemen and related personnel (485 subjects), trucking industry (90 subjects), rock and roll band members (40 subjects), and steel fabrication workers (200 subjects). Results indicate significant hearing loss occurred in several, but not

all occupational settings studied. Resulting data are included in several technical reports to be published in 1972.

In a survey of hearing conservation programs in manufacturing, transportation, mining, and construction industries, 4,295 questionnaires were sent out and 2,324 were returned (54 percent). Results will be published in 1972. Preliminary results indicate that approximately 15 percent of companies had hearing conversation programs which included audiometric testing while another 10 percent were planning to begin a program.

Experimental laboratory and field studies were conducted on the effects of intermittent noise on resultant temporary threshold shift. Results showed that published criteria on intermittent noise were inadequate. Further studies will be carried out within NIOSH and by contract to study these effects in 1972.

A study was initiated to establish the effects of whole body vibration on the health of heavy equipment operators. The survey will comprise a 1-year prospective study of morbidity experience in a cohort of 30,000 heavy construction union health plan members. Utilizing automated union membership data, the NIOSH team will divide the workers into three or more groups according to the vibration characteristics of their respective jobs. During the survey period, the morbidity experience patterns of each of the groups will be determined from health plan claims filed by the members. Currently, some 1,000 claims a week are received. Data analysis will include a comparison of morbidity experience by job group and by age. The relevant data from the claims records for the first 3 months of the study have been selected and transferred to a standard data format.

An annotated critical literature review of all available references on the effects of vibration on worker health was completed. The literature suggests that serious health deterioration can be produced in workers who are subjected for years to low frequency whole body vibration. A 5-year program to determine the kind and extent of the health problems and to establish safe exposure limits is being formulated and will include both contract and in-house research.

In the field of electromagnetic radiation, studies are planned in developing instrumentation for detecting ultraviolet hazards to workers, and in determining hazards from microwaves and lasers.

## EPIDEMIOLOGY

Occupational health standards present problems often different from those involved in occupational safety; therefore, the Act emphasizes the need for exploring ways to discover latent diseases and establishing causal connections between diseases and work in environmental conditions. These points were further emphasized in section 20(a)(7) with the requirement that the Secretary of HEW shall conduct and publish industrywide studies of the effect of chronic or low-level exposure to industrial materials, processes, and stresses on the potential for illness, disease, or loss of functional capacity in aging adults.

Consistent with this mandate, NIOSH has initiated a program of industrywide epidemiological research. The essential elements of this research program include the wide spectrum of medical, biostatistical, and environmental-engineering disciplines. Depending on the specific occupational health problem, investigations may be initiated at any level of depth, and may bypass a series of levels depending on the availability of data resources or the magnitude of the potential hazard or risk. Under the principles of inferential statistics, study is made of representative samples of specific occupational groups known or suspected to be experiencing unusual disease patterns.

Historically, the epidemiological approach to occupational health research in the United States has been largely limited to cross-sectional study of acute toxic manifestations for which the etiology could be readily deduced by the temporal proximity, or to the routine compilation of industrial injury statistics. Little effort has been expended to identify and even less to elucidate the latent biological effects following chronic low-level exposures to chemical or physical agents in the work environment. This paucity of research has persisted in spite of the possibility that the major health impact from occupational exposures may well be insidious in nature. That such may be the case is demonstrated by the relative contribution (number and excess risk) of non-violent to violent deaths in the mortality patterns observed during the major portion of the working and subsequent lifetime of several occupational groups investigated by NIOSH personnel (Table 5–1).

Implementation of an innovative industrywide epidemiological program should avert much suffering among the employed population resulting

Table 5–1 Number of deaths and risk of death among selected occupational groups

| Study group | Violent deaths | | Non-violent deaths | |
|---|---|---|---|---|
| | Observed | Excess per 100,000 men per year | Observed | Excess per 100,000 men per year |
| Underground metal miners [1] | 64 | 31. 2 | 866 | 1, 243. 6 |
| Smelter workers [2] | 232 | . 8 | 1, 645 | 193. 4 |
| Uranium miners [3] | 126 | 190. 7 | 311 | 231. 8 |

[1] Wagoner, J. K., Miller, R. W., Lundin, F. E., Fraumeni, J. F., and Hall, M. E.: Unusual cancer mortality among a group of underground metal miners. *New England Journal of Medicine* 269: 284–289, 1963.
[2] Lee, A. M., and Fraumeni, J. F.: Arsenic and respiratory cancer in man: an occupational study. *Journal of the National Cancer Institute*. 42: 1045-1052, 1969.
[3] Lundin, F. E., Wagoner, J. K., and Archer, V. E.: Radon daughter exposure and respiratory cancer—quantitative and temporal aspects. NIOSH-NIEHS Joint Monograph No. 1, National Technical Information Service, Springfield, Va., 1971.

from needless hazards in the working environment. In addition, such research will contribute to the well-being of future generations through identification of mutagenic, teratogenic, and oncogenic response in offspring of individuals exposed to chemical, physical, and biological agents in the working environment. Furthermore, knowledge gained from the study of occupational diseases will have broad application to the prevention of disease in the general populace resulting from exposure to similar agents.

Initial effort in the NIOSH program of industrywide epidemiological research is directed toward the early identification of unusual disease and injury patterns among industrial groups. One such investigation is the evaluation of several disability risk parameters according to industrial group and job classification among workers covered by the Rhode Island Disability Insurance Plan during 1960. In addition, six studies have been initiated or planned utilizing existing and easily retrievable records from union death benefit files and industry insurance files (Table 5–2, groups 1 through 7). To elucidate the apparent associations detected by this exploratory approach or demonstrated under experimental conditions, 11 retrospective cohort studies have been undertaken or planned of occupational groups employed over a major portion of each individual's lifetime (Table 5–2, groups 8 through 18). Records (including detailed work histories and exposure data where available) have been acquired from industry, union, or license registry sources, and vital status ascertainment (site specific cancer incidence and/or cause specific mortality) is underway or completed through an intense follow-up scheme utilizing records from the Social Security Administration, Internal Revenue Service, and U.S. Postal Service, as well as State Motor Vehicle, Vital Statistics, and Tumor Registry records. This study approach, employing life-table analysis, seeks to quantitate the risk of disease and to demonstrate exposure response relationships, thus permitting definition of "safe" exposure levels.

In order to define the broad range of nonmalignant responses in working populations, nine medical surveys have been planned or are in progress (Table 5–2, groups 14 through 22). Current medical studies are designed to: (1) determine the health status of specific working populations; (2) relate the prevalence of abnormal findings to cumulative exposure; and (3) relate the incidence of abnormal findings to current exposure levels. Current exposure levels are determined by both recognized and innovative sampling methods and strategies, and available past exposure levels are obtained from Federal, State, and company records.

Epidemiological investigation of uranium miners has been an important area of NIOSH research. A product of this investigation was the publication of the monograph entitled "Radon Daughter Exposure and Respiratory Cancer—Quantitative and Temporal Aspects" which provided the criteria on which the occupational standard of radon daughter exposure for uranium miners was based. As a follow-up to this guidance, testimony concerning respiratory and medical controls was given before the Bureau of Mines public hearing on proposed variance procedures.

The Department of Labor, in denying a petition by the American Iron and Steel Institute for a variance from the occupational health standard for coal tar pitch volatiles, cited research by NIOSH epidemiologists showing an extremely high rate of lung cancer among coke oven workers.

Table 5–2 NIOSH industrywide epidemiological research studies

| Occupational or professional group | Suspect agents | Suspect biological response | Source of data | Number of individuals in study | Type of study | Implications to occupational safety and health |
|---|---|---|---|---|---|---|
| 1. Industrial workers in Rhode Island. | To be ascertained. | To be ascertained. | Rhode Island disability insurance plan awards. | 30, 000 | Cross sectional study of cause specific morbidity. | Exploratory research into possible association between job classification and cause specific disability. |
| 2. Printing pressmen. | Benzene and other chemicals. | Malignancies of buccal cavity, esophagus, lymphatic and hematopoietic tissue, and nonmalignant respiratory disease. | Death benefit file of International Printing Pressmen and Assistants' Union of North America. | 3, 000 | Cross sectional comparison of cause specific proportionate mortality with that of general population. | Exploratory research into association between on-the-job exposures and disease manifestation. |
| 3. Gray iron foundry workers. | Silica, iron oxide dusts, metal fumes, and chemicals. | Malignant and nonmalignant respiratory disease. | Insurance files and employment files of several automobile manufacturers. | 7, 500 | -----do---------- | do---------- |
| 4. Construction machinery operators. | Engine exhausts, whole body vibration and dusts of various kinds. | Malignant and nonmalignant respiratory disease, prostatic conditions, and injuries. | Death benefit file of International Union of Operating Engineers. | 1, 500 | -----do---------- | do---------- |
| 5. Stationary engineers. | Infrared radiation, arsenic, carbon monoxide, heat, and asbestos. | Malignancies particularly of the respiratory system, CVR disease and injuries. | -----do---------- | 1, 500 | -----do---------- | do---------- |
| 6. Woodworkers. | Wood dust. | Malignancies of nasal pharynx and other sites. | Death benefit file of United Brotherhood of Carpenters and Joiners. | 28, 000 | -----do---------- | do---------- |
| 7. Dentists. | X-radiation, mercury and anesthetics. | Leukemia and lymphatic malignancies, suicides, and diseases of the nervous system. | Records of the American Dental Association. | 15, 000 | Cross sectional study of cause specific mortality rates according to age and specialty group. | Exploratory research into possible association between chemical exposures and risk of suicides and diseases of lymphatic and nervous system. Attempt to resolve risk of leukemia among individuals exposed to low-level irradiation. |

Table 5–2 NIOSH industrywide epidemiological research studies—Continued

| Occupational or professional group | Suspect agents | Suspect biological response | Source of data | Number of individuals in study | Type of study | Implications to occupational safety and health |
|---|---|---|---|---|---|---|
| 8. Metal machinists. | Cutting oil mists. | Malignant and non-malignant respiratory disease. | Employment file of an automobile manufacturing plant. | 24, 000 | Retrospective cohort study utilizing life-table method to examine cause-specific mortality according to job classification. | Initial analyses directed toward identifying associations between cutting oil mist and disease manifestation. Data capable of supporting exposure-response relationship analyses. |
| 9. Uranium mill workers. | Thorium 230. | Malignancies of lymphatic system. | Employment files of 3 uranium companies. | 3, 000 | do | Confirmation of previous indications of an excess risk and the quantification of that risk. |
| 10. Cotton textile workers. | Cotton dust. | Non-malignant respiratory disease. | Employment files of 2 cotton textile companies. | 10, 000 | do | do |
| 11. Potash miners and mill workers. | Diesel fumes and chemicals. | Malignant and non-malignant respiratory disease. | Employment file of 7 potash mining companies. | 5, 500 | do | do |
| 12. Sheet metal workers. | Fibrous glass and asbestos. | Malignant and non-malignant respiratory disease. | Pension fund file of Sheet Metal Workers' International Association. | 5, 000 | do | Exploratory research into possible association between on-the-job exposures and death from specific causes. |
| 13. Steelworkers. | Coal tar pitch volatiles and a great variety of other exposures. | Malignancies and other causes of death. | Employment files of 7 steel plants in Allegheny County, Pa. | 59, 000 | Retrospective cohort study utilizing life-table method to examine cause—specific mortality according to 60 different work areas and job classification. | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 14. Cosmetologists. | Hair spray (PVP) hair dye (24 TDA) and aerosol gases. | Malignancies of respiratory system, lymphatic system, bladder, non-malignant respiratory disease and cardiac disease. | A. Connecticut State Department of Health (Registry and Licensure Division and Tumor Registry). | 10,000 | A. Retrospective cohort study utilizing life-table method to examine site-specific cancer incidence and cause-specific mortality. | A. Confirmation of previous indications of an excess risk and the quantification of that risk according to usage of sprays and dyes. |
| | | | B. Examination of currently employed cosmetologists utilizing pulmonary function, X-ray, and sputum cytology. | 800 | B. Cross sectional study of prevalence of pulmonary and cardiac abnormalities. | B. do. |
| 15. Fibrous glass workers. | Fibrous glass. | Malignant and non-malignant respiratory disease. | A. Employment files of 5 fibrous glass plants. | 7,000 | A. Retrospective cohort study utilizing life-table method to examine cause specific mortality. | A. Evaluation of speculation regarding association of fibrous glass exposure and malignant and non-malignant respiratory disease. |
| | | | B. Examination of currently employed workers utilizing X-rays, pulmonary function tests, and respiratory questionnaires. | 500 | B. Cross sectional study of prevalence of pulmonary abnormalities. | B. Determination of health status of fibrous glass workers, and assessment of association between on-the-job exposures and disease manifestations. |
| | | | C. 5 fibrous glass plants. | -------- | C. Comprehensive industrial hygiene survey and air sampling. | C. Assessment of status of in-plant environmental controls, and identification of appropriate sampling methods and strategies. |

Table 5–2 NIOSH industrywide epidemiological research studies—Continued

| Occupational or professional group | Suspect agents | Suspect biological response | Source of data | Number of individuals in study | Type of study | Implications to occupational safety and health |
|---|---|---|---|---|---|---|
| 16. Beryllium production workers. | Beryllium. | Malignant and non-malignant respiratory disease. | A. Employment files of 4 beryllium production plants and personal interviews. | 8, 800 | A. Retroactive cohort study utilizing life-table method to examine cause specific mortality. | A. To evaluate question of association between beryllium exposure and lung cancer. |
| | | | B. Examination of currently employed workers utilizing X-rays, pulmonary function tests, and respiratory questionnaires. | 1, 600 | B. Cross sectional study of prevalence of pulmonary abnormalities. | B. Determination of health status of beryllium workers, and assessment of association between on-the-job exposures and disease manifestations. |
| | | | C. 4 beryllium production plants. | -------- | C. Comprehensive industrial hygiene survey and air sampling. | C. Assessment of status of in-plant environmental controls, and identification of appropriate sampling methods and strategies. |
| 17. Asbestos products workers. | Asbestos. | Asbestosis, lung cancer, mesothelioma, other malignancies. | A. Personnel files of 10 asbestos products plants. | 20, 000 | A. Retrospective cohort study utilizing life-table method to examine cause specific mortality. | A. Confirmation of previous indications of excess risk and evaluation of speculation regarding association of asbestos exposure and ovarian cancer. |
| | | | B. Examination of currently employed workers utilizing X-rays, pulmonary function tests, and respiratory questionnaires. | 2, 700 | B. Cross sectional study of prevalence of pulmonary abnormalities. | B. Determination of health status of asbestos plant workers, and assessment of association between on-the-job exposures and disease manifestations. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | C. Numerous asbestos textile, friction, insulation, and cement pipe plants. | -------- | C. Comprehensive industrial hygiene survey and personal air sampling. | C. Assessment of status of in-plant environmental controls, and identification of appropriate sampling methods and strategies. |
| 18. Uranium miners | Radon daughters. | Malignant respiratory disease. | A. Physical examination and annual census of uranium industry and radon daughter measurements. | 14, 000 | A. Retrospective cohort study utilizing life-table method to examine cause-specific mortality. | A. Determination of exposure-response relationship between radon daughters and lung cancer risk. |
| | | | B. Annual sputum cytology examination. | 2, 000 | B. Regression analyses of atypical sputum and cumulative radiation exposure. | B. Determination of diagnostic value of sputum cytology for early detector of lung cancer. |
| 19. Operating room personnel. | Halothane, nitrous oxide and other anesthetic agents. | A. Miscarriages. | A. Examination of currently employed female operating room personnel and general duty nurses utilizing a questionnaire. Measurement of trace concentration of anesthetics. | To be determined. | A. Prospective study of incidence of miscarriages in operating room personnel. | A. Exploratory research regarding expected decrease in incidence of miscarriages with reduction in trace concentration of anesthetics. |
| | | B. Alterations in psychological function. | B. Examination of currently employed operating room personnel utilizing battery of psychometric tests. Measurement of trace concentrations of anesthetics. | To be determined. | B. Cross sectional comparison of trace concentrations of anesthetics with alteration in psychological functions. | B. Exploratory research regarding expected association between exposure to trace concentrations of anesthetics and alteration in psychological function. |

Table 5–2 NIOSH industrywide epidemiological research studies—Continued

| Occupational or professional group | Suspect agents | Suspect biological response | Source of data | Number of individuals in study | Type of study | Implications to occupational safety and health |
|---|---|---|---|---|---|---|
| 20. Non-ferrous smelter workers. | A. $SO_2$, $As_2O_3$. | A. Non-malignant and malignant respiratory disease. | A. Examinination of currently employed non-ferrous smelter workers utilizing X-rays, pulmonary function test, sputum cytology, and respiratory questionnaire. | 500 | A. Cross sectional study of prevalence of pulmonary abnormalities according to $SO_2$ and other air contaminant exposure levels. | A. Exploratory research into association between chronic $SO_2$ exposures and disease manifestations. |
| | B. $SO_2$. | B. Nonmalignant respiratory disease. | B. Examination of newly employed nonferrous smelter workers utilizing X-rays, pulmonary function tests, and respiratory questionnaires. | 400 | B. Longitudinal study of incidence of pulmonary abnormalities. | B. Exploratory research into association between current $SO_2$ exposure levels and incidence of pulmonary abnormalities. |
| 21. Cotton gin workers. | Cotton dust. | Byssinosis and chronic lung disease. | Examination of currently employed cotton gin workers and matched controls utilizing X-rays, pulmonary function tests, and respiratory questionnaires. | 700 | Cross sectional study of prevalence of pulmonary abnormalities and incidence of these conditions in a subcohort of 300 individuals according to dust exposure levels. | Exploratory research into the association between on-the-job exposures and disease manifestations. |
| 22. Granite workers. | Granite dust, silica. | Chronic lung disease and silicosis. | Examination of currently employed granite workers utilizing X-rays, pulmonary function tests, and respiratory questionnaires. | 1, 200 | Longitudinal study of incidence of pulmonary abnormalities and decrement of pulmonary function. | Exploratory research into the association between on-the-job exposures and disease manifestations. |

At the same time, the Department of Labor requested additional research by NIOSH bearing on this standard.

Additional coal tar pitch volatiles and other contaminant measurements were made in an aluminum reduction plant and have resulted in a planning session for an industrywide study.

A cooperative study by NIOSH and the Vermont State Health Department was conducted in a granite shed being operated under the no-ventilation conditions prevailing in the 1920's. This environmental study provides the first direct measurements of respirable mass concentrations of quartz under former conditions—data which are essential in the NIOSH review of health standards for respirable quartz.

In recognition of its role in preventive medicine and public health, NIOSH has referred to the worker and his private physician medical findings among those 2,700 asbestos workers and 700 cotton gin workers whose examinations indicated need for further clinical evaluation. Abnormal X-ray and pulmonary function findings have been noteworthy among workers in asbestos textile and insulation plants.

Following all surveys, both environmental and medical, comprehensive industrial hygiene reports, sampling data, and summaries of medical data are forwarded to companies and appropriate State occupational health agencies. When warranted, reports are also forwarded to the Department of Labor.

## GRANTS

NIOSH conducts a program of grants for support of research at universities, State and local agencies, and other public and non-profit institutions on problems related to its areas of responsibility including programs aimed at maintaining and improving the workers' health and safety through control of disease and harmful conditions.

In awarding grants, NIOSH makes use of consultative groups of distinguished scientists. These groups, organized as study sections, review proposals submitted by eligible institutions on behalf of named investigators and provide objective appraisals of their scientific merit. These appraisals are then reviewed by NIOSH for a final determination of funding, within available budgets.

Problems in occupational health and safety have become more diverse and difficult to manage because of increasingly rapid technological changes and industrial expansion. These factors dictate the need for continuing research to keep control measures in step with changing occupational health and safety problems. The extramural grant program of NIOSH permits enlistment of research capabilities at universities, State and local agencies, and other public and non-profit institutions in the definition, assessment, elucidation and control of these problems throug' funding of approved research in the following categories:

1. Laboratory, clinical, and epidemiologic studies and development of diagnostic, preventive, therapeutic, mechanistic and interpretive aspects of diseases, pathologic changes, physiologic and psychologic alterations presumed to arise out of an occupational causation. Examples of areas of interest include: the pneumoconioses; the acute, subacute, and chronic effects of toxic chemicals, metals, dusts, fumes, gases, and mists, acting upon any organ or system of the body; the effects of physical agents, including heat, cold, noise, vibration, and changes of pressure; and the effects of living agents of disease when the major emphasis is upon occupation in transmission or in the modification of human physiological or behavioral response.

2. Studies of psychological and motivational factors and relationships in occupational situations and the impact on mental health and job performance.

3. The development, evaluation, and application of methods for the sampling, analysis, measurement or other objective appraisal of chemical, physical, biological, motivational, behavioral and other components of the occupational environment and of the extent of exposure to these components.

4. The development, evaluation, and application of methods for diagnosing and measuring the effects of occupational or industrial hazards upon the health of population groups through statistical studies of morbidity and mortality or other means.

5. The development and application of methods for evaluating the varying capacity of workers to withstand stresses imposed on them in their work environment.



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6. The development and evaluation of methods for protecting people at work from harmful environmental factors arising out of their employment.

7. Studies on the effect of impaired physical and mental states upon the ability of workers to perform their work safely and effectively, including the proper placement and observation of workers with physical or mental impairments.

8. Studies of the interrelationship between conditions of employment and the development and course of chronic diseases.

9. Studies of the cause and nature of fatigue and its relation to the individual's increased susceptibility to accidents and occupational disease.

10. Studies of the socioeconomic factors relating to or arising out of disease associated with occupation.

11. Studies on absenteeism and its causes.

12. Studies of the factors involved in the development, function, and utilization of occupational health programs.

## SPECIAL FOREIGN CURRENCY PROGRAM

The Special Foreign Currency Program (Public Law 83–480) operates under authority from the President in section 104(b)(3) of the Agricultural Trade Development and Assistance Act as amended (Public Law 83–480), and other appropriate authority in the Public Health Service Act (Public Law 78–410). The program is supported by U.S. owned foreign currencies which have been determined by the Department of the Treasury to be in excess of normal United States needs in certain designated countries. These excess currencies were obtained through the sale of agricultural products and must be used in the foreign countries involved. There is no appropriated NIOSH dollar outflow from the United States in connection with this program.

NIOSH utilizes these funds to support safety and health research and research related activities in foreign countries to implement and augment the NIOSH domestic programs designed to meet the mission and responsibilities established by the Act.

These foreign currencies enable NIOSH to carry out productive and significant research projects taking advantage of unique resources and conditions within the host country. Primary emphasis is placed on the development of projects addressed to problems relating to occupational disease prevention and control and basic biomedical research, all of which are directly relevant to high priority United States health needs.

As has been the policy in the past, NIOSH continues to direct its Public Law 480 activities so that each project will augment the domestic program and will relate to one or more of the high priority toxic substance or physical agent hazards, of the work environment which menace the health and safety of the worker. The impact of the Public Law 480 activities on the domestic research program broadens the base of information used to establish and support the criteria documents.

Through the Public Law 480 program, some aspects of the problems and subject groups can frequently be studied under conditions which would be most difficult to do in the domestic program. This then enlarges the NIOSH domestic program and provides the opportunity for in-depth retrospective and prospective studies and observations on the health of the worker population as related to time-dose exposures to hazardous substances in their working environment.

In 1971 NIOSH had 23 continuing Public Law 480 research agreements. Also, 15 new Public Law 480 research agreements were developed and prepared for negotiation and funding in 1971. NIOSH Public Law 480 agreements are with research institutes in five participating countries: Poland, Yugoslavia, Egypt, Israel and India. Each agreement is directly concerned with one or more occupational safety and health problems and the related work environment combination which is also included by NIOSH in its domestic priority program.

The general areas of safety and health concern toward which the NIOSH Public Law 480 program is directed include:

1. Occupational chest diseases including chronic nonspecific respiratory disorders, asbestosis, byssinosis, mica and cement pneumoconiosis.

2. Toxic chemicals including carbon disulfide, lead, mercury, cadmium, zinc, and nickel.

3. Heat and work including heat related illnesses, water and electrolyte requirements, heat stroke, special heat protective equipment.

4. Interactions between hazards including differences in tolerances in older workers, and in men as compared to women, in ethnic groups, combinations of toxic materials and physical work, diurnal variability in tolerance and performance capacity, changes in tolerances to toxic substances in individuals on various thereapeutic drugs regimen, noise, and vibration.

## Chapter 6

# LABORATORY SERVICES

In support of the overall mission of NIOSH, three service laboratories have been established. The *analytical chemistry* laboratory provides support primarily in the analysis of air samples to determine the presence of toxic products which may be generated in industrial atmospheres. The engineering group at the *maintenance and calibration* laboratory supports field teams by providing air sampling and measurement equipment. The *testing and certification* laboratory provides testing services for proposed safety and health equipment and develops performance standards for certification.

The three service laboratories have the back-up support of their respective research groups who recommend standard methods of data collection and analysis and assist in the development of new or revised techniques in the sampling and analysis of samples collected in support of the overall occupational safety and health program.

Consultant services are also provided to industry, State, and local governments, and other branches of the Federal Government. An interagency agreement was instituted in September 1971 to provide the Occupational Safety and Health Administration of the Department of Labor with the use of NIOSH laboratory facilities and technical supervision by experienced NIOSH industrial hygiene chemists and engineers.

## ANALYTICAL CHEMISTRY

Most routine analytical chemistry services are conducted at NIOSH laboratories in Salt Lake City, Utah. Additional personnel and equipment were acquired to meet the increased workload resulting from the passage of the Act.

During 1971, sampling data sheets were developed for use by Occupational Safety and Health Administration field personnel. These sheets provide investigators with the necessary information to collect samples in sufficient quantities for subsequent analysis and in such a manner that the results will be legally meaningful.

Procedures were prepared for collecting the following air contaminants: crystalline free silica, asbestos, cotton dust, beryllium, carbon monoxide, and inorganic lead. Sampling data sheets are in preparation for the following: organic lead such as tetraethyl and tetramethyl lead; mixed organic vapors such as mineral spirits; mercury; and several gases such as sulfur dioxide and nitrogen dioxide. Also in preparation are instructions on handling and shipment of samples.

Development efforts in support of the service function included increased capabilities to encompass the analysis of pesticides and related compounds. Automation of selected analytical procedures and instrument methods was achieved in order to identify toxic compounds in air samples collected during the Hazard Evaluations conducted by NIOSH personnel (see Chapter 7). In addition, analytical techniques were developed for approximately 50 compounds identified as health hazards in industry.

During the last 4 months of 1971, 1,282 samples were analyzed for various NIOSH groups, and 670 samples (requiring 826 analyses) were processed for Department of Labor field personnel. Approximately 95 percent of the properly collected samples were analyzed and the results returned within 48 to 72 hours from the time of arrival in the NIOSH laboratory.

## MAINTENANCE AND CALIBRATION

Maintenance and calibration services are provided to all divisions of NIOSH, the Department of Labor and other governmental agencies on request. All calibration systems used in the laboratory meet the standards maintained by the National Bureau of Standards. These systems include equipment to calibrate the following: visible light in the 50 to 500 foot-candle range, sound level, air velocity, pressure and vacuum, combustible gases, personal sampling pumps, high volume air sampling equipment, carbon monoxide, electrical test equipment, and detector tubes. Reliability and measurement specification standards have been written for several of these items.

## TESTING AND CERTIFICATION

To ensure that devices used for evaluation and control of occupational safety and health hazards meet minimum standards required to protect the health and safety of workers, a Testing and Certification Laboratory is being established in NIOSH facilities in Morgantown, West Virginia. Responsibilities will include: (1) the development of performance specifications for each device; (2) publication of these specifications and certification procedures in the *Federal Register;* (3) initial approval testing of such devices; (4) surveys of manufacturers' establishments to ensure continuous operation of a satisfactory manufacturer's quality control program; and (5) periodic testing of certified items procured on the open market.

The classes of devices now being considered for testing and certification at the laboratory are respirators, coal mine dust personal samplers, direct reading gas and vapor detector tubes, and personal protective equipment.

## Chapter 7

# HAZARD EVALUATION AND CONTROL PROGRAMS

NIOSH technical service activities include comprehensive technical assistance, consultation, and demonstration services to public and private agencies responsible for the control of occupational diseases and accidental work injuries. Additional technical service functions include: (1) reviewing State plans and grants with the Occupational Safety and Health Administration; (2) coordinating NIOSH activities related to the determination of potential toxicity of substances used or found in the workplace; (3) stimulating, programming, and monitoring activities related to the development of new and innovative methods of recognizing, evaluating, and controlling occupational hazards; (4) operating NIOSH technical information inquiry service; and (5) conducting a program to improve the quality of occupational medical care for American working men and women. Specific program activities and accomplishments are detailed below.

## HEALTH HAZARD EVALUATIONS

Section 20(a)(6) of the Act directs the Secretary of HEW to determine following a written request by any employer or authorized representative of employees, specifying with reasonable particularity the grounds on which the request is made, whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found; and shall submit such determination both to employers and affected employees as soon as possible. Under general recommendations of a NIOSH Task Force, implementation of these provisions of the Act has been assumed by a newly created Hazard Evaluation Services Team which consists of a central office staff and industrial hygienists in each of the 10 HEW regions. This team, with support as required from other NIOSH program areas, will respond to requests for toxicity determinations.

The central staff receives all requests, collects the necessary additional information, and relays the requests to the appropriate NIOSH Regional Office for initial investigation. The central staff is responsible for arranging and coordinating any additional activities that may be indicated from the results of the plant evaluation and the recommendations of the NIOSH Regional Industrial Hygienist. Such activities might include the development of field sampling or laboratory analytical methods, animal toxicity studies, medical studies, and/or long-term epidemiological studies.

Proposed regulations (42 CFR part 85) pursuant to section 20(a)(6) of the Act have been prepared and are soon to be published in the *Federal Register*. A request form to assist employers and employees in registering requests is now available (see Appendix K). Initial response has been encouraging; some 25 requests have incorporated approximately 75 substances for toxicity determinations. These requests are in various stages of completion and involve environmental, medical, toxicological, and analytical methodology studies. The results of these surveys may serve as the basis for criteria for new standards or may be used to aid in validating existing standards; in addition, NIOSH notifies the Department of Labor of any serious violation of a standard that may be detected in the course of a survey. The employer is initially informed of this obligation even though NIOSH has no enforcement authority and is principally interested in helping plant management solve its problems.

## INDUSTRIAL HYGIENE SERVICES

NIOSH industrial hygienists provide consultation, technical assistance, and other services related to the engineering and industrial hygiene aspects of occupational safety and health to Federal, State and local agencies; labor; industry; and other groups and individuals. These activities are supported and supplemented by several projects underway:

—Development and operation of a program to assess precautionary labeling requirements for potentially hazardous materials used in the workplace and to make appropriate recommendations for labeling and warning criteria.
—Preparation of manuals of good industrial hygiene practices for a wide variety of industrial processes and operations to aid in the recognition, evaluation, and control of hazardous conditions in the workplace.
—Development of an "Industrial Hygiene Inspection Procedures Guide" to facilitate a more complete and accurate assessment of the enormously wide variety of potentially toxic substances found in the workplace.

Industrial hygiene consultation and service have been provided to various Federal agencies such as the Internal Revenue Service, the Food and Drug Administration, the U.S. Mint, the Government Printing Office, Federal prisons, and Veterans Administration hospitals. Services have also been provided to several State government agencies.

Fifty technical service studies were performed and included such problem areas as asbestos, mercury, benzene, beryllium, carbon monoxide, proteolytic enzymes, lead, and noise. Approximately 3,000 workers were directly affected by the several hundred recommendations that were made to alleviate the existing conditions measured during these studies.

Plans have been made for two manuals of good industrial hygiene practices to be prepared. They are "Metal Welding and Cutting" and "Degreasing and Industrial Cleaning." Approximately 800 Material Safety Data Sheets, obtained by the U.S. Department of Labor under the Longshoremen's and Harbor Workers' Act, have been reviewed and indexed for possible retrieval on the following parameters: name, manufacturer, chemical composition, and health or fire hazard rating. Material Safety Data Sheets are provided by the manufacturer and provide toxicity data and safe handling procedures.

## MEDICAL SERVICES

The NIOSH technical service program provides medical and nursing technical assistance to industry, State, and local governmental agencies, and employee groups to prevent occupational disease and injury. The program also includes the conducting of medical and nursing evaluations of special problems relating to requests for hazard evaluations. It provides the primary medical and nursing assistance resource for NIOSH. In addition, it assesses occupational health needs and develops mechanisms to meet these needs.

More than 80 occupational medical and nursing technical assistance and consultation activities were provided to a variety of official agencies, industries, and individuals. A project has been initiated to study the existing employee health services in 7,000 general hospitals in the United States. The information gained from this study will hopefully be incorporated as a criteria to be used by hospital accreditation groups.

A study is being developed to demonstrate new and innovative methods of extending occupational medical care to agricultural populations in areas where physicians' services are not available. This will be accomplished via medical diagnostic care extended to the areas by a two-way television approach and utilizing trained nurses who assist the physicians in central clinics. Cost comparisons, effectiveness, and patient acceptability will be evaluated. Medical studies of the health problems associated with plasma fractionation and with penicillin manufacture are also presently underway.

## TECHNICAL INFORMATION SERVICES

NIOSH maintains a center of competence in the acquisition and handling of technical information in the field of occupational safety and health. The program involves a survey of the sources of technical literature and insures that such literature is acquired for the support of NIOSH requirements. Personal technical responses are made to inquiries

from the general public, official agencies, universities, and other sources. During 1971, about 1,400 requests for information were received and processed. About 50 percent of these required a literature search followed by the preparation of a written evaluated response. NIOSH personnel also develop and publish pamphlets and other informational materials in selected subject areas for distribution to industrial workers and to the public to aid the worker in control or prevention of job injuries and illnesses.

Sources of scientific and technical information have been surveyed and acquisition of pertinent information has been facilitated through the establishment of deposit accounts with the major sources (e.g., Smithsonian Science Information Exchange, the National Technical Service, and the Chemical Abstracts Service). An agreement is currently pending between NIOSH and the International Occupational Safety and Health Information Centre (CIS) of the International Labour Office in Geneva. This agreement will establish NIOSH as the U.S. National Center of CIS and will provide NIOSH with approximately 11,000 microform documents abstracted on CIS cards. Currently, NIOSH has available 6,500 documents in microform. Additionally, subscriptions to selected journals in the occupational safety and health fields have been increased from 198 to 312 during 1971. This provides NIOSH with the core of current journal literature in occupational safety and health.

## Chapter 8

# DEVELOPMENT OF PREVENTIVE PROGRAMS

The relationship of the employee's health to the Nation's health is so integrated that the problems of the worksite must be considered an extension of the National health problem, with all its implications for preventive, as well as health care delivery services. With this impetus, NIOSH is planning the initiation of developmental programs in the following areas:

1. Development of model occupational health programs for use or implementation by industry, Federal, State, and local governments.

2. The stimulation of the development of, and initial support for, clinics to provide occupational health services to clusters of small industries in a geographically compact area.

3. Through a series of such demonstration clinics, to demonstrate the profitability of occupational health programs to industry and other potential providers of health and safety services.

4. To document, via "break-even analysis" the threshold number of employees required for favorable cost benefit ratio for a given level of occupational health service.

American business has not been oblivious to the benefits of such programs as approximately 28 percent of the workforce is now covered at the worksite by employee health services of varying degrees of sophistication. It is true that these operations have generally been efficient only in workforces which are above 300–500 employees. For this reason, the coverage cited is achieved by only 0.3 percent of the worksites in existence in the U.S. It is for this reason that NIOSH will encourage the expansion of such services through the grouping of smaller industries in a concentrated geographical area to extend the service to a larger percentage of the working population.

Employees in small industrial operations in the United States are rarely provided with the same range and quality of occupational health services that are frequently available in larger industries. In spite of repeated attention being called to this problem in the past, no program has been developed to offer promise of a wide-scale solution. Within NIOSH, however, a program is underway to provide an answer to the problem. This is being achieved through a long-term occupational health grant involving Brookdale Hospital Center and Columbia University.

This grant's method of solving the problem is based on the simple premise that if a single small plant cannot afford its own occupational health services, it must join with others to create a unit of sufficient size to be economically feasible. A logical base for such a cooperative facility is a general hospital where most of the needed resources can be found: an emergency room, laboratories, X-ray equipment, and examining rooms as well as trained personnel.

The following services are offered by the Brookdale Occupational Health Program:

1. Diagnosis, treatment, and followup of industrial injuries or diseases.

2. Preemployment examinations.

3. Periodic health examinations.

4. Plant visits by industrial hygienist, safety engineer, and physician.

5. Immunization.

6. Professional advice and diagnostic services for employees exposed to communicable disease.

7. The setting up and operation of part-time plant dispensaries in industries where this service is needed.

8. First-aid training for employees.

9. Treatment of minor illnesses during employees' working hours.

10. Consultation with management on absenteeism problems.

11. Consultation with management and insurance carriers on Workmen's Compensation Board cases.

12. Rehabilitation services for employees who are recovering from serious illness.

13. Special examinations for employees exposed to toxic and environmental hazards, for food handlers, for the physically impaired, and for employees who have hazardous jobs.

# Chapter 9

# MANPOWER DEVELOPMENT

Section 21(a) of the Act states that the Secretary of HEW, after consultation with the Secretary of Labor and with other appropriate Federal departments and agencies, shall conduct, directly or by grants or contracts, education programs to provide an adequate supply of qualified personnel to carry out the purposes of the Act.

## NATIONAL OCCUPATIONAL SAFETY AND HEALTH NEEDS

Tentative estimates have been made of the number of occupational safety and health professionals needed in the overall manpower pool. These tentative estimates were based on NIOSH studies, on information provided by professional societies, and on analysis of needed work. The number of professionals presently needed to fill the estimated demands are as follows: 1,000 industrial hygienists, 8,000 occupational health nurses, 3,000 industrial physicians, 8,000 occupational health scientists, and 10,000 safety/health professionals.

A NIOSH task force with representation from the Department of Labor has provided a logical framework within which short- and long-term training and educational goals of NIOSH can be established. The implementation plans included participation and support of all appropriate mechanisms and educational systems, comprising academic programs ranging in level from junior colleges through post-graduate specialty programs and the continuing education systems.

Through a contract, a selected panel of occupational safety and health practitioners determined those levels of knowledge and skills to be expected from graduates of open-ended associate and baccalaureate degree programs. A second panel of educators, working with the input from potential consumers (employers) and their educational system constraints, made recommendations on such open-ended curricula. Results of this study are being used to guide the development of educational training materials for such programs and, as appropriate, general guidance to NIOSH and educational institutions.

The recently published monograph, "Occupational Health Content in Baccalaureate Nursing Education," resulted from work done under contract. Numerous seminars have been held with nursing educators to help them apply the framework and material of the monograph within their own institutions.

An assistance program has been established within NIOSH to provide help to continuing education groups, universities, agencies, industry, and employee groups in conducting occupational safety and health educational programs.

## PROFESSIONAL DEVELOPMENT

NIOSH conducts short courses of 1 to 2 weeks duration in various aspects of occupational safety and health primarily for employees of State and local occupational safety and health agencies. The health maintenance program at NIOSH has provided training in occupational health nursing practices with relation to the following specific areas: occupational disease, mental health, administration and supervision, and chronic diseases. Approximately 300 trainee weeks of instruction were provided.

Training has also been provided by NIOSH in the field of environmental management. This program has centered on the recognition, evaluation,

and control of occupational hazards. Trainees involved were from HEW, the Department of Labor, other Federal agencies, State and local agencies, universities, and industry. Some 830 trainee weeks of instruction were provided in 26 course presentations. In addition four course presentations for a total of 170 Occupational Safety and Health Administration compliance officers were held on request of the Department of Labor.

An extern training program for NIOSH and other governmental agency employees has been developed by contract. The pilot course was presented in September through December 1971. The full course consists of 12 weeks of didactic instruction, laboratory and field trips, followed by 8 weeks of experience working in an occupational safety and health unit of a cooperating industry or agency. This is the training program which the NIOSH Hazard Surveillance Engineers attended and which was mentioned in Chapter 3.

## TRAINING GRANTS

Section 21(a)(1) of the Act authorizes grants to colleges and universities and other nonprofit private institutions providing graduate or specialized training in occuptaional safety and health. These grants are for the purpose of initiating, strengthening, and expanding graduate, undergraduate, and special training programs to enable them to assist in the provision of an adequate supply of qualified personnel to carry out the purposes of the Act. Appendix H contains a list of all 1971 active NIOSH training grants.

Recognizing that a multidisciplinary approach is required to mount an effective attack on occupational safety and health problems, the policy made necessary by the Public Health Service Act (Public Law 78–410, section 301) of providing support to institutions engaged solely in the training of individuals interested in careers in research and teaching has been broadened, under authorities of Public Law 91–596, to include assistance to programs geared to the training of individuals in the practical aspects of safety and occupational health. Foremost among these are occupational medicine, occupational health nursing, industrial hygiene, and occupational safety engineering.

Within this framework, all levels of training are possible. There is a need for the highly trained professional to practice preventive medicine, teach, conduct research, administer programs, and direct the efforts of those engaged in activities requiring lesser degrees of skill. A requirement also exists for substantial numbers of personnel at the technician or para-professional level to carry out the day-to-day monitoring and surveillance programs and to assist in the development and management of occupational safety and health programs conducted by industry and health agencies.

Of equal importance to the task of providing a sufficient number of trained personnel to satisfy manpower requirements under the Act, is the necessity of upgrading the competency of safety and health professionals in current employment. For example, according to one estimate, the half-life of medical knowledge is about 10 years. Therefore if the purposes envisioned by the Act are to be fulfilled, consideration must be given to the need for constant updating of knowledge among practitioners at all levels. Pursuant to this, NIOSH has adopted the policy of making funds available for the support of intensive training programs of less than 1 year for:

—Providing specialized instruction for occupational safety and health personnel which will increase their capability in an area within their respective fields.

—Preparing or expanding the abilities of occupational safety and health professionals for leadership roles such as administrators or supervisors.

—Preparing or expanding the teaching capabilities of occupational safety and health professionals.

In 1971, one such grant was funded. It provided for specialized training in industrial hearing conservation to professionals in the field of hearing conservation. This training was designed to examine and define the peculiar needs of industry in terms of hearing conservation and to provide the nucleus of a standardized network of professional service agencies for delivering a variety of needed hearing conservation services to the labor force.

Because of the broad spectrum of need, NIOSH has conducted a program of diversified training support. Occupational safety and health projects in the following areas received assistance during 1971: industrial safety engineering, systems safety engineering, industrial hygiene, occupational

biomechanics, occupational medicine, industrial biostatistics, occupational psychiatry, acoustic environmental control, bioenvironmental engineering, and industrial hearing conservation. A total of 20 projects grants (7 occupational safety and 13 occupational health) with 17 universities involving approximately 734 students (152 with stipend; 582 without stipend) received support. Of the students matriculating with stipend, 100 were doctoral degree candidates, 48 were master degree candidates, and four attended without degree objective. Students with no stipend received training in one or more courses within a grant-assisted project.

# APPENDICES

A. Organizational and Functional Statements
B. Chronology of Organizational Identification Occupational Safety and Health Program of the United States Public Health Service (1914–1971)
C. Secretary Richardson's Dedication Message for Appalachian Center for Occupational Safety and Health, November 27, 1971
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APPENDIX A

federal register

WEDNESDAY, JUNE 30, 1971
WASHINGTON, D.C.

Volume 36 ■ Number 126

## Office of the Secretary
## PUBLIC HEALTH SERVICE
### Statement of Organization, Functions and Delegations of Authority

As of May 17, 1971, the organizational elements of the Environmental Health Service that remained within HEW after the creation of the Independent Environmental Protection Agency on December 2, 1970, were transferred—

To the Food and Drug Administration:

The Bureau of Radiological Health.

To the Health Services and Mental Health Administration:

The National Institute for Occupational Safety and Health.

The Bureau of Community Environmental Management.

The changes in organization that are indicated below show how the latter two units are being incorporated into HSMHA.

Part 3 (Health Services and Mental Health Administration) of the Statement of Organization, Functions, and Delegations of Authority for the Department of Health, Education, and Welfare (33 F.R. 15953, October 30, 1968), as amended, and former Part 3 (33 F.R. 19050, December 20, 1968) are further amended as follows:

Under former Part 3, which was entitled Consumer Protection and Environmental Health Service, delete paragraph (g) Bureau of Community Environmental Management and succeeding paragraphs (g–1) through (g–3), and delete paragraph (h) Bureau of Occupational Safety and Health and succeeding paragraphs (h–1) through (h–3).

Part 3, which now is the part assigned to the Health Services and Mental Health Administration, is hereby amended with regard to section 3–B, Organization, as follows:

Following the paragraph entitled "St. Elizabeths Hospital—Division of Clinical and Community Services (3J71)" under the center head National Institute of Mental Health (3J00), insert a new center head and succeeding paragraphs reading:

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (3K00)

Plans, directs, and coordinates the national program effort to develop and establish recommended occupational safety and health standards and to conduct research, training, and related activities to assure safe and healthful working conditions for every working man and woman:

(1) Administers research in the field of occupational safety and health, including the psychological factors involved; (2) develops innovative methods and approaches for dealing with occupational safety and health problems; (3) provides medical criteria which will ensure, insofar as practicable, that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work experience, with emphasis on ways to discover latent disease, establishing casual relationship between diseases and work conditions; (4) serves as a principal focus for training programs to increase the number and competence of personnel engaged in the practice of occupational safety and health; (5) develops and coordinates the appropriate reporting procedures which assist in accurately describing the nature of the national occupational safety and health problems; and (6) consults with the U.S. Department of Labor, other Federal agencies, State and local government agencies, industry and employee organizations and other appropriate individuals, institutes, and organizations with regard to promotion of occupational safety and health.

*Office of the Director* (*3K01*). (1) Plans, directs, coordinates, and evaluates the operations of the institute; (2) maintains liaison with, and provides advice and assistance to, the U.S. Department of Labor, the U.S. Department of the Interior, other Federal agencies, State and local government agencies, international health organizations, and outside groups; (3) provides coordination with the Federal Health Programs Service's occupational health activities for Federal employees; and (4) provides policy guidance and coordination to occupational safety and health activities in the Regional Offices.

*Office of Public Information* (*3K17*). (1) Assists and advises the Institute Director and the Divisions on public information policies and activities; (2)



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provides information materials for response to public inquiries; (3) coordinates printing, publication, and clearance procedures for the Institute; and (4) assists in developing displays, exhibits, and illustrations.

*Office of Extramural Activities (3K18).* (1) Advises the Institute Director on matters relating to the development and progress of Institute-supported external research; (2) in cooperation with the offices and operating divisions of the Institute, stimulates research, training, and demonstration grants in relevant priority areas; and (3) administers the management aspects of the Institute's grants programs by receiving, reviewing, analyzing, and evaluating all grant applications.

*Office of Administrative Management (3K19).* (1) Provides management information, advice, and guidance to the Institute Director; (2) coordinates all management activities in the conduct of finance, personnel, and procurement functions; (3) relates administrative management activities to programs; and (4) develops necessary policies, procedures, and operations, and provides such special reports and studies as may be required in the management area.

*Office of Planning and Resource Management (3K21).* (1) Plans and coordinates the strategy and philosophy of operation of the Institute regarding mission and objectives; (2) conducts or participates in special studies for program planning and evaluation; (3) conducts the necessary control functions to assure operational compliance toward program objectives within the Institute; and (4) provides management systems consultation and analyses.

*Office of Research and Standards Development (3K23).* (1) Reviews existing scientific criteria for health and safety standards and assesses through priority systems the needs for additional research program areas for criteria development; and (2) coordinates and maintains an overview of research activities in the operating divisions of the Institute with the ultimate aim toward finalization of criteria and standards.

*Office of Manpower Development (3K25).* (1) Provides policy guidance and evaluates the Institute's manpower development and training activities; (2) advises the Institute Director on national health manpower needs related to occupational safety and health, and relates to other Federal agencies regarding occupational safety and health manpower needs; and (3) conducts equal employment opportunity activities of the Institute as part of the total HSMHA-EEO program.

*Office of Health Surveillance and Biometrics (3K27).* (1) Operates as the principal statistical and data research unit in the Institute; (2) monitors new as well as existing occupational hazards, and maintains surveillance on the incidence of occupational illness and disease; (3) in coordination with the U.S. Department of Labor, establishes a priority list for the conduct of research and the development of standards; (4) develops and conducts record studies of work population groups to determine the national trends and problem areas related to job health and safety, and provides health policy guidance in epidemiology; and (5) coordinates the Institute's electronic data processing requirements, to ensure that adequate computer facilities and services are available.

*Division of Laboratories and Criteria Development (3K43).* (1) Develops criteria for standards for the control of chemical, biological, and physical hazards to the health and safety of the working population, and initiates standard methodology and instrumentation for the detection, evaluation, and control of such hazards; (2) evaluates the toxicity, health, and safety hazards of industrial substances, processes, and other agents, as well as current research requirements and regulations; (3) conducts methodology studies for evaluating the varying capacity of workers to withstand physical and psychological responses; (4) provides for equipment development, analytical service, and calibration needs of other operating divisions within the Institute, and maintains an analytical and calibrations service for the U.S. Department of Labor; and (5) evaluates and certifies the performance of safety and health equipment.

*Division of Field Studies and Clinical Investigators (3K47).* (1) Conducts nationwide studies, surveys, and comprehensive analyses to determine the health status of the working population, including the incidence and prevalence of disease and injury; and (2) initiates studies to determine chronic and long-term effects of work-related exposures to toxic and hazardous substances.

*Division of Technical Services (3K53).* (1) Provides demonstrations, technical assistance, and consultation to public and private agencies responsible for the control of occupational diseases and accidental work injuries; (2) through the Regional Offices and its central staff serves as the focal point for the review of State plans and grants with the U.S. Department of Labor and makes the initial responses to requests for hazards evaluations; (3) in cooperation with the Office of Extramural Activities, stimulates, programs, and monitors demonstration grants for new and innovative methods of recognizing, evaluating, and controlling occupational hazards; (4) prepares manuals of good practice for safe work procedures; and (5) operates the technical information inquiry service of the institute.

*Division of Occupational Health Programs (3K57).* (1) Promotes occupational health programs at the State and local governmental levels as well as in industry and agriculture; (2) provides technical guidance in the development of occupational health programs; and (3) correlates the practice of occupational medicine in industry with the total delivery of health services.

*Division of Training (3K63).* (1) Develops and plans short-term training activities for Federal, State, and local governments, industry, and other appropriate organizations in the field of occupational safety and health; and (2) conducts such short-term training.

*Appalachian Laboratory for Occupational Respiratory Diseases (3K67).* (1) Conducts studies of the incidences and prevalence of occupational respiratory diseases in specific work groups with particular emphasis on coal workers' pneumoconiosis; and (2) provides medical and engineering research and service to fulfill the Institute's responsibilities under the Federal Coal Mine Health and Safety Act of 1969.

# APPENDIX B

# CHRONOLOGY OF ORGANIZATIONAL IDENTIFICATION OCCUPATIONAL SAFETY AND HEALTH PROGRAM OF THE UNITED STATES PUBLIC HEALTH SERVICE (1914–1971)

1914—Office of Industrial Hygiene and Sanitation was organized in the Division of Scientific Research, Public Health Service, U.S. Treasury Department. The Office was transferred in 1918 from the U.S. Marine Hospital, Pittsburgh, Pennsylvania to Washington, D.C. Other changes in name and organization took place in the intervening years.

February 1937—Division of Scientific Research was consolidated with National Institutes of Health. Office of Industrial Hygiene and Sanitation together with the Office of Dermatoses Investigations became the Division of Industrial Hygiene.

1939—Reorganization Act of 1939 placed Public Health Service in the Federal Security Agency. Staff of the Division of Industrial Hygiene moved to National Institutes of Health at Bethesda, Maryland in December 1939.

July 1944—Division of Industrial Hygiene was transferred from National Institutes of Health to Bureau of State Services, Public Health Service, Federal Security Agency.

1947—Division of Industrial Hygiene moved its offices from Bethesda to Washington, D.C.

1949—Division of Industrial Hygiene established its Salt Lake City Field Station.

1950—Division of Industrial Hygiene established its Field Headquarters at Cincinnati.

April 1953—Department of Health, Education, and Welfare was created by Reorganization Plan 1 of 1953. Federal Security Agency was abolished.

1953—Division of Industrial Hygiene became the Occupational Health Program, Division of Special Health Services, Bureau of State Services.

1960—The Occupational Health Program was reorganized as the Division of Occupational Health, Bureau of State Services.

January 1966—Appalachian Laboratory for Occupational Respiratory Diseases established at Morgantown, West Virginia.

1966—Public Health Service reorganization in accordance with Presidential Reorganization Plan 3, 1966. Division of Occupational Health was designated the Occupational Health Program, National Center for Urban and Industrial Health, Bureau of Disease Prevention and Environmental Control.

Summer 1967—Washington, D.C. headquarter's staff was transferred to the Cincinnati facility.

July 1968—Further reorganization of Public Health Service. Bureau of Disease Prevention and Environmental Control was abolished and the Environmental Control Administration, Consumer Protection and Environmental Health Service was established. Occupational Health Program became part of Environmental Control Administration.

1968—Beginning in September, the Office of the Chief, Occupational Health Program was reestablished in the Washington, D.C. area at Rockville, Maryland. Salt Lake City Field Station moved to new quarters in October.

December 1968—The Occupational Health Program was designated the Bureau of Occupa-

tional Safety and Health, Environmental Control Administration, Consumer Protection and Environmental Health Service.

December 1969—Consumer Protection and Environmental Health Service was abolished and the Environmental Health Service created and the Bureau of Occupational Safety and Health placed within it.

December 1970—Most of the programs within the Environmental Health Service transferred to the Environmental Protection Agency but Bureau of Occupational Safety and Health reported directly to the Department of Health, Education, and Welfare Office of the Assistant Secretary for Health and Scientific Affairs.

April 1971—Bureau of Occupational Safety and Health placed within the Health Services and Mental Health Administration.

May 1971—Bureau of Occupational Safety and Health reorganized into the National Institute for Occupational Safety and Health.

# APPENDIX C

# SECRETARY RICHARDSON'S DEDICATION MESSAGE FOR APPALACHIAN CENTER FOR OCCUPATIONAL SAFETY AND HEALTH, NOVEMBER 27, 1971

I deeply regret not being able to participate in today's dedication of the beautiful new Appalachian Center for Occupational Safety and Health. My absence today does not, however, lessen my appreciation for the significance of this occasion.

The new Center represents a common response by the City of Morgantown, West Virginia University, and the Department of Health, Education, and Welfare, to a serious national problem—the health and safety of America's workforce.

The research conducted here will be the basis for new mandatory national standards which will help to assure all of us a safe and healthful working environment. For that reason, an enormous amount of attention will be focused on the work that is done here. In addition to responsibilities for occupational respiratory disease research, the new Center will also have responsibility for operating a testing and certification program for occupational safety and health equipment.

There is no doubt in my mind that the new Center, with its extremely talented and dedicated staff, will succeed in its objectives. Let me assure you of my personal interest and the interest of the Department of Health, Education, and Welfare. Congratulations and very best wishes to all of you.

ELLIOTT L. RICHARDSON,
*Secretary of Health, Education, and Welfare*

# APPENDIX D

# NATIONAL OCCUPATIONAL HAZARD SURVEY FORM

## DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
## HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
## NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

## NATIONAL SURVEILLANCE NETWORK

## NATIONAL OCCUPATIONAL HAZARD SURVEY FORM

## PREFACE

1. Facility Name_____
2. Address_____
3. City_____ State_____ Zip Code_____
4. Legal Owner(s)_____
5. Person(s) Interviewed_____

| Name | Title | Part |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

6. Area Code_____ Telephone_____
7. Date Survey Started or Visit Made_____
8. Facility Identifier_____

If mailing address or person to contact concerning information about the survey is different from that indicated above, list the correct mailing address and contact below.

9. Facility Name_____
10. Address_____
11. City_____ State_____ Zip Code_____
12. Attention_____ Title_____
13. Area Code_____ Telephone_____



Form Approved OMB No. 68-R-1261

# NATIONAL SURVEILLANCE NETWORK

# NATIONAL OCCUPATIONAL HAZARD SURVEY

## PART I

Facility Health and Safety Services

1. Revision code
2. Date survey started (month/day/year)
3. State code
4. Facility identifier code
5. a. What is your major activity?
   b. What are your chief products, services, lines of trade, etc.?
   SIC code if known.
6. Approximately how many years has this facility been involved in this activity?
7. How many people are on your facility payroll for all shifts at the present time?
8. Of this number, how many are normally in the work areas as opposed to the administrative or other areas?
9. How many shifts do you have?
10. Has this facility received industrial hygiene services during the past year?
    - Yes, from an industrial hygienist (1)
    - Yes, from a safety engineer (Skip to Question 13) (2)
    - Yes, from other. Specify: (3)
    - No (Skip to Question 13) (4)
11. Is the industrial hygienist based in this facility?
    - Yes (1)
    - No, based elsewhere (2)
    - No, consulting basis (3)
    - No, other. Specify: (4)
    - Not applicable (5)
12. Estimate the average number of industrial hygienist hours that are devoted to your facility per month.
13. Has your facility received safety engineer services during the past year?
    - Yes, from a safety engineer based in this facility (1)
    - Yes, from a safety engineer based elsewhere (2)
    - Yes, on a consulting basis (3)
    - Yes, other. Specify: (4)
    - No (5)
14. Estimate the average number of safety engineer hours that are devoted to your facility per month.
15. Is there a formally established health unit at this facility?
    - Yes, physician in charge (1)
    - Yes, Registered Nurse in charge (2)
    - Yes, Licensed Practical Nurse in charge (3)
    - Yes, other in charge. Specify: (4)
    - No (5)

16. Do you employ or have an arrangement with a physician or clinic to give your employees medical care?
    - Yes, employed full time (1)
    - Yes, employed part time (2)
    - Yes, on call (Skip to Question 18) (3)
    - Yes, at clinic (Skip to Question 18) (4)
    - Other. Specify: (5)
    - No arrangements made (Skip to Question 18) (6)
17. Estimate the average number of physician hours that are devoted to your facility per week?
18. Do you have one or more nurses at this facility to provide care for employees?
    - Yes (1)
    - No (Question 19—Not applicable) (2)
19. How many Registered Nurses and Licensed Practical Nurses are employed at this facility?
20. Estimate the average number of nursing hours that are devoted to your facility per week.
21. Do you have an employee at this facility with formal first-aid training, other than doctors or nurses, who has been designated to provide emergency treatment?
    - Yes (1)
    - No (2)
22. Do you record health information about a new employee on some regular form?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)
23. Before new employees are hired or placed, are they required to take a medical examination?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)
24. Do you require medical examinations of your employees who return to work after a sickness, or whose employment is terminated?
    - Return to work only (1)
    - Exit examination at time of termination only (2)
    - Both (3)
    - Neither (4)
25. Do you provide periodic medical examinations or tests of any type for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)
26. Do you provide periodic ophthalmologic examinations for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)

27. Do you provide periodic audiometric examinations for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)

28. Do you provide periodic blood tests for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)

29. Do you provide periodic urine tests for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)

30. Do you provide periodic pulmonary function tests for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)

31. Do you provide periodic chest X-rays for employees?
    - Yes, all employees (1)
    - Yes, executive and/or managerial only (2)
    - Yes, other employees (3)
    - No (4)

32. Do you have a regularly scheduled program to give employees flu or other immunizations?
    - Yes (1)
    - No (2)

33. Do you keep employee absenteeism records?
    - Yes, showing specific nature of sickness when absent (1)
    - Yes, showing only the type of absence (2)
    - Yes, without showing type of absence (3)
    - No (4)

34. What is your rate of unscheduled absenteeism (days per year per employee)?

35. Is there a formally established safety committee at your facility?
    - Yes, investigative (1)
    - Yes, policy setting (2)
    - Both (3)
    - Yes, other. Specify: (e.g. advisory only) (4)
    - No (5)

36. Do you have areas where personal protective devices are required or recommended?
    - Yes, required (1)
    - Yes, recommended (2)
    - Yes, both (3)
    - No (4)

37. Who provides personal protective devices?
    - Employee (1)
    - Employer (2)
    - Both (3)
    - Other. Specify: (4)
    - Not applicable (5)

38. Who has been designated to see to it that personal protective devices are serviced and maintained?
    - Individual employees (1)
    - Employer representative (2)
    - Both (3)
    - Other. Specify: (4)
    - No one (5)
    - Not applicable (6)

39. How do you carry your workmen's compensation insurance?
    - Private insurance company (1)
    - Self-insured (2)
    - State insurance fund (3)
    - Other. Specify: (4)
    - None (5)

40. Are any unions operating in this facility?
    - Yes (1)
    - No (2)

41. Is this facility a member of a national association or institute representing its industry or trade?
    - Yes (1)
    - No (2)

42. Do you have a program under which you regularly monitor the presence of fumes, gases, mists, vapors, dusts, noise, vibration, radiation or other similar conditions?
    - Yes (1)
    - No (2)

43. Do you use a private sewage treatment plant or a septic tank to dispose of this facility's nonprocess sewage?
    - Yes, private sewage treatment plant (1)
    - Yes, septic tank (2)
    - Yes, both (3)
    - No (4)

44. Do you have any drinking water other than that provided through a public water supply?
    - Yes. Specify: (1)
    - No (2)

45. Is the private water supply routinely tested for bacteriological quality?
    - Yes (1)
    - No (2)
    - Not applicable (3)

46. Do you have any piped liquids other than drinking water?
    - Yes. Specify: (1)
    - No (2)

47. Is there a separate, identified eating area for your work area employees?
    - Yes (1)
    - No (2)

48. Are hand washing facilities provided within 200 feet of the eating area?
    Yes (1)
    No (2)
    Not applicable (3)
49. May I see the Summary of Occupational Injuries and Illnesses (OSHA Form 102)?
    Occupational injuries

    *Occupational Illnesses*

    Occupational skin diseases or disorders
    Dust diseases of the lungs (pneumoconioses)
    Respiratory conditions due to toxic materials
    Poisoning (systemic effects of toxic materials)
    Disorder due to physical agents (other than toxic materials)
    Disorders due to repeated trauma
    All other occupational illnesses. Specify:
50. How many months are covered by the preceding figures?

NATIONAL SURVEILLANCE NETWORK
NATIONAL OCCUPATIONAL HAZARD SURVEY

## PART II – EXPOSURE DATA

DUPLICATE INTO EACH LINE BELOW

| Card Code | Revision Number | Date Survey Started (Mo./Day/Yr.) | State Code | Facility Identifier | Page Number |
|---|---|---|---|---|---|
| 1 | 2 4 | 5 10 | 11 12 | 13 18 | 19 21 |
| 3 | 0 0 9 | | | | |

Remarks

| COMPUTER PROCESSING | | Number of Employees | EMPLOYEE GROUP TITLE 63 / POTENTIAL EXPOSURE | | | | | Intended Control | | ACTIVITY |
|---|---|---|---|---|---|---|---|---|---|---|
| Line No. | Special Instructions | | Name | Code | Form | Int. | Dur. | Code | F/N | |
| 22 23 | 24 28 | 29 31 | 32 34 63 | 64 68 | 69 | 70 | 71 | 72 73 | 74 | |
| 05 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 40 | | | | | | | | | | |
| 45 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 55 | | | | | | | | | | |
| 60 | | | | | | | | | | |
| 65 | | | | | | | | | | |
| 70 | | | | | | | | | | |
| 75 | | | | | | | | | | |
| 80 | | | | | | | | | | |
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HSM

## NATIONAL SURVEILLANCE NETWORK

## NATIONAL OCCUPATIONAL HAZARD SURVEY FORM

## PART III

## SURVEYOR CONFIDENTIAL

1. Revision code
2. Date survey started (month/day/year)
3. State code
4. Facility identifier code
5. Disposition of survey:

| | |
|---|---|
| Completed | (1) |
| Partially completed | (2) |
| Refused to be interviewed | (3) |
| Could not be located | (4) |
| Out of business | (5) |
| Temporarily closed | (6) |
| Other | (7) |

(*Specify*) _____

6. Number of Part II forms completed as a result of this survey.
7. How much time, in hours and minutes, was spent on each of the following activities?

Travel to and from facility
Conduct of survey
Sample and measurement
Waiting and discussions
Completion of survey forms

8. Surveyor identifier

# APPENDIX E

# NIOSH PRIORITY LIST FOR TOXIC SUBSTANCES AND PHYSICAL AGENTS

Criteria Developed:

- Asbestos
- Coal Dust

In Progress:

- Benzene
- Beryllium
- Cadmium and Compounds
- Carbon Monoxide
- Chromic Acid Mist
- Cotton Dust
- Fibrous Glass
- Heat Stress
- Lead
- Mercury
- Noise
- Parathion
- Silica
- Trichloroethylene
- Ultraviolet

Priorities:

1. Bis(Chloromethyl) Ether
   Coal Tar Pitch Volatiles
   2-Naphthylamine
   Toluene Diisocyanate
   Radioactive Products of Uranium Mining (Gaseous and Particulate)
2. Benzidine and Its Salts
   Carbon Tetrachloride
   Ozone
   Sulfur Dioxide
   Tin and Compounds
3. Chromium Compounds
   Dichlorobenzidine
   Oxides of Nitrogen
   Sodium Hydroxide
   Sulfuric Acid
4. Carbaryl
   Chloroform
   4-Dimethylaminoazobenzene
   Nitric Acid
   Toluene
5. Ammonia
   beta-Propiolactone
   Epoxy Resins
   Methylene Chloride
   4-Nitrodiphenyl
6. Asphalt Fumes
   Ethylene Dichloride
   Fluoride and HF
   Polychlorinated Biphenyls
   Tetrachloroethylene
7. 2-Acetylaminofluorene
   Chlorobenzene
   Methylene Bisphenyl Isocyanate (MBI)
   Phosgene
   Trichloroethane
8. Acetone
   4-Aminodiphenyl
   Dieldrin
   Malathion
   N-Nitrosodimethylamine
9. Aniline
   Copper and Compounds
   Cyanides
   Styrene
   Zinc and Compounds

10. Chlorine
    Formaldehyde
    Manganese and Compounds
    Phenol
    Platinum and Compounds
11. Acrolein
    Aluminum and Compounds
    Carbon Disulfide
    Methyl Ethyl Ketone
    Vinyl Chloride
12. Creosote
    Methyl Chloride
    Nickel and Compounds
    Phosphorus and Compounds
    Tetrachloroethane
13. Acrylonitrile
    2,4-Dinitrophenol
    Magnesium and Compounds
    Methyl Alcohol
    Paraffin
14. Ammonium Nitrate
    Cold Stress
    Dioxane
    Fluorine
    Microwaves
15. Hydrogen Chloride
    Ethyl Benzene
    Nitroglycerin
    Vibration
    Xylene
16. Methyl Butyl Ketone
    Mineral Spirits
    Oil Mists
    Selenium and Compounds
    Turpentine
17. Arsine
    Gasoline
    Kerosene
    Iron and Compounds
    Petroleum Naphtha
18. Barotrauma
    Cresol
    Paraquat
    Portland Cement
    Talc
19. Carbon Black
    Coherent Energy (Laser Radiation)
    Ethylene Oxide
    Impact Noise
    Proteolytic Enzymes

# APPENDIX F

# FORMAT FOR CRITERIA DOCUMENT

PREFACE
CONTRIBUTORS AND REVIEWERS
DEFINITIONS—to include abbreviations if required

I. INTRODUCTION—brief description of pertinent information to introduce the problem.

II. REVIEW OF PROBLEM—adapt outline to applicability of agent but retain recommended format.
(Example)
A. Recognition of Hazard
1. Historical
2. Presence in industrial environment—industrial use or incidental occurence.

III. PHYSICAL-CHEMICAL PROPERTIES—summary of the properties of the agent and related agents under study which are pertinent to the problem.

IV. CRITICAL EVALUATION OF DATA
A. Biological Effects—include respiratory, dermal, gastrointestinal, etc., as well as carcinogenic, mutagenic, teratogenic, and behavioral effects where applicable.
1. Effects on humans
a. Acute effects
b. Chronic effects
2. Effects on animals
a. Acute effects
b. Chronic effects
3. Conclusion—include areas for future investigation

B. Methodology—information pertinent to the problem. Utilize reference sources for extensive discussions or procedures.
1. Environmental sampling methods
2. Analytical or measurement of exposure
a. Qualitative
b. Quantitative
3. Biological analytical methods
a. Qualitative
b. Quantitative
4. Conclusion

C. Medical—include epidemiologic evidence, diagnostic methods, examination schedules, and clinical tests as applicable.
Conclusion

D. Safety Hazards and Precautions—include fire, explosive, corrosive, radiation, etc., as applicable
Conclusion

E. Protective Equipment
1. Respiratory devices
2. Protective clothing
Conclusion

F. Control Procedures—information leading to current recommendations and specific values for standards where applicable for:
1. Labeling and warning devices
2. Housekeeping, maintenance, and cleanup operations
Ventilation—due to established engineering methods, references only are generally needed
3. Enclosure and isolation methods—brief comments with references generally suffice
5. Waste handling and discard
6. Conclusion

V. SUMMARY

VI. REFERENCES—references to literature cited should be numbered in parentheses in text and listed in alphabetic order at the end of the document. Journal citations in the reference list should contain the following: a) names and initials of all authors; b) title of article; c) journal title as listed in the

current edition of "Chemical Abstracts List of Periodicals"; d) volume, inclusive pages, and year.

Book references should be in the following order: author, title, city of publication, publisher, year, and page.

Citations such as "Personal communication", should not be entered in the list of References, but may be noted in the document without serial numbers, in parentheses.

VII. APPENDIX—THE RECOMMENDED STANDARDS AND PROCEDURES

A. Recommended Standards
   1. Environmental standard—specific values which refer to a 7 or 8 hour workday and 40 hour workweek. Special recommendations are to be given for carcinogenicity, unusual thermal decomposition problems, mixtures and similar areas of special concern. Excursion and recommended ceiling values will be listed if applicable.
   2. Biological Standard—specific values for blood, urine, or breath if applicable.

B. Recommended Field Sampling, Analytical or Measurement Methods—each recommended method is to be presented in detail, step by step.
   1. Environmental exposure methods
      a. Sampling
      b. Analytical and/or measurement
   2. Biological methods
      a. Sampling
      b. Analytical and/or measurement

C. Medical Procedures
   1. Criteria for diagnosis of disease
   2. Examinations
      a. Type
      b. Specific intervals
   3. Clinical test methods
      a. Type
      b. Specific intervals

D. Recommended Safety Procedures—fire, explosive, corrosive, radiation, etc., as applicable.

   NOTE—If any factor for the agent under study presents an immediate potential health hazard considered greater than inhalation or direct surface exposure, i.e., explosion or fire, precedence should be given to this factor in listed order of The Recommended Standards and Procedures.

E. Protective Equipment
   1. Respiratory devices
   2. Protective clothing

F. Control Procedures
   1. Labeling and warning devices
   2. Housekeeping, maintenance, and clean-up operations
   3. Ventilation
   4. Enclosure and isolation methods
   5. Waste handling and discard



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# APPENDIX G

# NIOSH CONTRACTS

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| ANALYTICAL SERVICES | | | |
| HSM–99–71–033—Evaluation of Spark Source Mass Spectrometry (SSMS) in the Analysis of Biological Samples, John Carlberg. | Accu-Labs Research, Inc., Arvada, Colo. | $10,000.00 | June 30, 1971 to Feb. 28, 1972. |
| | Determine the feasibility of spark source mass spectrometry as an in-house analytical tool for the determination of trace elements in biological and environmental samples of occupational health interest. | | |
| HSM–99–71–054—Evaluation of Electron Spectroscopy for Chemical Analysis, Donald J. Larsen. | Dow Chemical, Midland, Mich., George Carable. | 15,185.00 | June 30, 1971 to Jan. 29, 1972. |
| | Evaluate the applicability of electron spectroscopy for chemical analysis (ESCA) technique to occupational health problems such as homogenized lung tissue, low-temperature radio frequency ashed lung tissue, bulk dust, coal dust, and particulate matter deposited on membrane filters. | | |

## ASBESTOS

| | | | |
|---|---|---|---|
| CPE–70–107—Continuation of Research on Fibrous Dust Studies, L. J. Cralley. | Industrial Health Foundation of America, Inc., Pittsburgh, Pa., Paul Gross. | 58, 692. 00 | Mar. 9, 1970 to June 29, 1973. |
| | Study the lungs of adults from urban and rural areas coming to autopsy. The study shall determine the nature and quantity of fibers and ferruginous bodies present. These data will be correlated with presence or absence of pulmonary disease as well as work and residence histories and other data characterizing each person studied. | | |
| EHS C–71–109—Electromotive Interactions of Metals in Asbestos Carcinogenicity, Lewis J. Cralley. | University of Connecticut, School of Medicine. | 83, 834. 00 | Oct. 1, 1970 to Sept. 30, 1972. |
| | Provide information on the effect of metals higher in the electromotive series than nickel to govern the solubility and chemical reactiveness and to alter the capability of nickel and its compounds, when introduced intramuscularly into rats, to produce cancer. | | |
| HSM–99–71–024—Asbestos Lung Samples—Physical and Chemical Analysis, P. M. Quinn. | Tabershaw-Cooper Associates, Berkeley, Calif., W. Clark Cooper. | 37, 050. 00 | June 30, 1971 to Sept. 29, 1972. |
| | Obtain human tissues in order to investigate the etiology of asbestosis through a chemical comparison of asbestos-related diseased lungs and nondiseased lungs. | | |

## BERYLLIUM

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| HSM–99–71–017—Sample Frequency Analysis and Evaluation of Environmental Surveys, Robert Weidner. | Pennsylvania Department of Environmental Resources, Harrisburg, Pa., E. J. Baier. | 73, 813. 00 | June 30, 1971 to July 29, 1972. |
| | Provide a more comprehensive evaluation of the exposure of asbestos and beryllium workers to these dusts. The adequacy of these existing dust standards will also be determined. | | |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| **BYSSINOSIS** | | | |
| HSM–99–71–009—Mortality Study of Cotton Textile Workers, Howard Ayer. | Mt. Sinai School of Medicine, Erving J. Selikoff, New York, N.Y. | 64,500.00 | June 21, 1971 to June 20, 1972. |
| | Determine whether the mortality experiences of specific groups of cotton textile workers over periods of time, differ from other individuals living in the same areas, taking age, sex, and years of observation into account. | | |
| HSM–99–71–053—Data Processing for MASS, Alan Palmer. | University of Washington, Seattle, Wash., David Discher. | 2,397.00 | June 30, 1971 to October 29, 1971. |
| | Provide clerical help to hand measure 3,400 Forced Expiratory Spirogram recordings to provide input for the MASS IV System. | | |
| 68–03–0067—Data Reduction and Analysis for Field Test of MASS System, Alan Palmer. | University of Washington, Seattle, Wash., David Discher. | 6,892.00 | June 15, 1971 to November 15, 1971. |
| | Transfer all recorded spirometry data from the primary digital tape to a computer based data file system in preparation for analysis. Several other pieces of work will also be carried out. | | |
| **COAL-TAR PITCH VOLATILES** | | | |
| EHS C–71–104—Literature Search and Bibliographic Study on Coal-tar Pitch Volatiles, John V. Crable. | Franklin Institute, Philadelphia, Pa. | 29,666.00 | Nov. 2, 1970 to Jan. 3, 1972. |
| | Provide a complete annotated bibliography of existing and future publications pertinent to the development of criteria for a standard for safe occupational exposure to coal-tar pitch volatiles. | | |

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| BOSH–099–71–1—Development of an Index for Carcinogenic Hazard to Man of Coal-Tar-Pitch Volatiles, John V. Crable. | University of Cincinnati, Cincinnati, Ohio. | 25, 000. 00 | June 1, 1971 to May 31, 1972. |
| | Design and acquire detailed information on the photophysical properties of carcinogenic polynuclear hydrocarbons and their heterocylic analogues. Will provide for the development and evaluation of an electronic emission spectral index which can be related to the carcinogenic hazard of the respirable portion of coal-tar-pitch volatiles. | | |
| HSM–99–71–007—Evaluation of Sampling Procedures and Analytical Methods for Coal-Tar Pitch, John V. Crable. | Union Carbide Corp. Cleveland, Ohio, P. D. Coulter. | 190, 000. 00 | June 30, 1971 to June 29, 1972. |
| | Provide a means for evaluating abilities and efficiencies of sampling procedures and analytical methods in determining the potential hazards associated with coking and roofing operations. | | |

CRITERIA PACKAGE DEVELOPMENT

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|---|---|---|---|
| HSM–99–71–036—Development of Pertinent Information, Data, Criteria, and Documentation on Ultraviolet Light, Charles H. Powell. | Franklin Institute Research, Philadelphia, Pa., Alec Peters. | 16, 110. 00 | June 30, 1971 to Mar. 29, 1972. |
| | Prepare a document containing pertinent information, data, criteria, and documentation on ultra-violet light. | | |
| HSM–99–71–046—Development of Criteria and Recommended Standard on Mercury, Charles Powell. | Tabershaw-Cooper Associates, Berkeley, Calif., J. L. Balzer. | 46, 634. 00 | June 30, 1971 to Mar. 29, 1972. |
| | Prepare a document containing pertinent information, data, criteria, and documentation on mercury. | | |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| CRITERIA PACKAGE DEVELOPMENT—Continued | | | |
| HSM–99–71–059—Development of Criteria and Recommended Standard on Lead, Charles Powell. | IIT Research Institute, Chicago, Ill., P. Llewellen. | 33, 422. 00 | June 30, 1971 to May 28, 1972. |
| | Prepare a document containing pertinent information, data, criteria, and documentation on lead. | | |
| 68–03–0008—Development of Criteria and Recommended Standard on Be., Charles Powell. | Andrew Hosey, Cincinnati, Ohio. | 22, 875. 00 | Feb. 1, 1971 to Jan. 31, 1972. |
| | Prepare a document containing pertinent information, data, criteria, and a recommended interim standard on beryllium. | | |
| ENGINEERING | | | |
| HSM–99–71–011—Respirator Fit Criteria Development, Alan Gudeman. | Webb Associates, Yellow Springs, Ohio, Edmond Churchill. | 15, 239. 00 | June 30, 1971 to Mar. 29, 1972. |
| | Develop data for anthropometric specifications including an anthropometric sizing program which will define groups of workers as well as fit test procedures. | | |
| HSM–99–71–020—Heat Stress Instrument Development (WBGT Integrator), Clark Humphreys. | Yellow Springs Instrument, Yellow Springs, Ohio, Robert Sleight. | 22, 500. 00 | June 14, 1971 to July 13, 1972. |
| | Develop an instrument which will sense and indicate the 3 temperatures from which the WBGT index is determined and integrate these values to give a direct indication of the WBGT index. | | |

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|---|---|---|---|
| HSM–99–71–028—Determination of Pressure Loss Coefficients in Duct Systems, Clark Humphreys. | Ohio State University, Columbus, Ohio, C. F. Sedsy. | 41, 506. 00 | June 30, 1971 to Dec. 29, 1972. |
| | Develop reliable data on pressure losses occurring in branch fittings in exhaust duct systems. Data will be presented in such a form that they would be readily usable in the design of industrial exhaust systems. | | |
| HSM–99–71–031—Development of Personal Sampler Pump for Charcoal Tubes, Jeremiah Lynch. | A. J. Sipin Co., New York, N.Y., A. Sipin. | 28,688. 00 | June 30, 1971 to June 29, 1972. |
| | Development and testing of prototype personal sampler pump for use with charcoal tubes. The plans and specifications furnished will permit DOL and NIOSH to competitively procure additional units for field use. | | |
| HSM–99–71–037—Development of an Instrument for Monitoring and Recording the Stressfulness of the Environment, Clark Humphreys. | Bendix, Inc., Baltimore, Md., A. R. Willoughby. | 148, 000. 00 | June 30, 1971 to Dec. 31, 1972. |
| | Develop and construct an instrument which will sense, indicate, and record air temperature, humidity, air velocity and thermal radiation flux, or values from which these four variables may be determined. Will enable a complete analysis to be made of heat exchange between a workman and his environment. | | |
| HSM–99–71–040—Heat Stress Instrument Development (Globe thermometer), Clark Humphreys. | Cornell Aeronautical Laboratory, Buffalo, N.Y., G. A. Sterbutzel. | 31, 616. 00 | June 30, 1971 to June 29, 1972. |
| | Conduct research which will develop information on the optimum construction and use of the globe thermometer and on the calculation of radiant heat exchange from globe temperatures. | | |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| ENGINEERING—Continued | | | |
| HSM–99–71–044—Industrial Hygiene Methods for Measurement of Benzene, John Vining. | Northwest Environmental and Preventive Health Services, Richland, W. Va., Frank Adley. | 31,000.00 | June 30, 1971 to Mar. 29, 1972. |
| | Generate a detailed report on the state of the art in the measurement of benzene for industrial hygiene purposes. Included will be a critical evaluation of the methods available for sampling and analyzing for benzene for the purpose of testing for compliance monitoring exposure and evaluating control system performance. | | |
| HSM–99–71–047—Development of data to Evaluate Respiratory Protection (Abrasive Blasting), Alan Gudeman. | Boeing, Inc., Seattle, Wash., Austin Blair. | 151,685.00 | June 30, 1971 to Dec. 29, 1972. |
| | Develop data to evaluate respiratory protective practices employed by industries using abrasive blasting processes and evaluate the effectiveness of respirator programs with relation to such factors as respirator selection, instruction and training, use and maintenance. | | |
| HSM–99–71–048—Cyclone Performance Evaluation, John Vining. | New York University Medical Center, New York, N.Y., M. Lippman. | 26,112.00 | June 30, 1971 to June 29, 1972. |
| | Evaluate the performance of 3 large cyclones to determine the flowrate at which they should be operated to achieve the best approximation of the AEC–ACGIH size-selective dust curve. | | |
| HSM–99–71–061—Open Surface Tank Exhaust Design Criteria, Clark Humphreys. | Battell Research Institution, Columbus, Ohio, L. J. Flanigan. | 128,710.00 | June 30, 1971 to June 29, 1973. |
| | Develop design criteria for local exhaust systems which will assure the effective capture and removal of toxic contaminants emanating from open surface tanks. | | |

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| HSM–99–71–008—Epidemiological Study—Cutting Oil Workers, Pierre Decoufle. | Wayne State University, Detroit, Mich., Thieu Nghiem.<br><br>Analyze the cause-specific mortality patterns of workers exposed to several levels of cutting oil mists and the results compared with those for a nonexposed group. | 34,000.00 | June 30, 1971 to June 29, 1972. |
| HSM–99–71–029—Whole Body Vibration Among Equipment Operators—Morbidity Study, Austin Henschel. | University of California, Berkeley, Calif., T. H. Milby.<br><br>Establish the effects of whole body vibrations on the health of heavy equipment operators through a survey of morbidity experience in a cohort of 30,000 heavy construction union health plan members. | 39,362.00 | June 30, 1971 to Feb. 29, 1972. |
| HSM–99–71–032—A study of Long Term Mortality Expenses of Steel Workers, J. W. Lloyd. | Graduate School of Public Health, University of Pittsburgh, Pa., Carol K. Redmon.<br><br>Identify health and safety hazards in the steel-working environment by noting specific work areas and occupational groups which exhibit unusually high or low mortality from specific causes of death, and relate unusual disease experience to possible etiologic agents in the working environment. | 322,137.00 | June 30, 1971 to June 29, 1974. |
| HSM–99–71–055—Epidemiological Study of Sheet Metal Workers, J. W. Lloyd. | University of California, Berkeley, Calif., W. C. Cooper.<br><br>Determine the exposures to fibrous glass and other materials of sheet metal workers in Northern California and collect and analyze data pertaining to their health status. | 48,990.00 | June 30, 1971 to June 29, 1972. |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| **NATIONAL SURVEILLANCE NETWORK** | | | |
| HSM–99–71–010—Evaluation and Comparability of Compulsory Occupational Disease Reporting, Vernon E. Rose. | California Department of Health, Sacramento, Calif., T. H. Milby. | 69, 533. 00 | June 30, 1971 to June 29, 1972. |
| | Design a study, after ascertaining feasibility, in order to compare occupational disease data developed under the California Doctor's First Report System with that developed through the DOL employer recording and reporting system including validation and followup mechanism to ascertain the degree of comparability. | | |
| HSM–99–71–026—Sources of OD Morbidity Data, Vernon E. Rose. | University of Washington, Seattle, Wash., David Discher. | 45, 677. 00 | June 30, 1971 to June 29, 1972. |
| | Identify and evaluate sources of representative occupational disease/illness data from or within 1 of the States now using the standard industrial hygiene reporting system, which can in turn be related to the industrial hygiene findings generated by the appropriate control agency. | | |
| HSM–99–71–043—Training Procedures for National Occupational Hazard Study, C. Richard Witwer. | Auerbach Associates, Arlington, Va., Allan Czarra. | 66, 920. 00 | June 30, 1971 to Dec. 29, 1971. |
| | Identify and where necessary develop the procedures necessary to train and test surveyors for the National Occupational Hazard Survey. | | |

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| HSM–99–71–057—Development of Occupational Health Recording System, Vernon E. Rose. | EDP Inc., Falls Church, Va., M. H. Goer.<br><br>Develop the coding system and coding guidelines necessary to provide for a standardized and completely computerized data recording system using the revised occupatioal health survey/inspection form. | 27, 700. 00 | June 30, 1971 to Dec. 29, 1971. |

NOISE

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|---|---|---|---|
| EHS C–71–108—Evaluation of Hearing Levels of Residents Living Near a Major Airport, Alexander Cohen. | Environmental Acoustics, Los Angeles, Calif., John Parnell.<br><br>Determine whether persons living in an airport community may be subjected to operational aircraft noises sufficiently great to cause some change in their hearing sensitivity by statistically comparing a sample of residents living near an airport with a similar demographic sample not exposed to notable aircraft noise. | 18, 224. 00 | Nov. 16, 1970 to Nov. 15, 1971. |
| HSM–99–71–006—Industrial Noise Effects Study, Alexander Cohen. | Raytheon Service Co., Burlington, Massachusetts, R. J. Felbinger.<br><br>Determine if there is any evidence coupling severity of occupational noise conditions to the occurrence of extra-aural physical and behavioral disturbances in workers based upon entries in their medical, safety and attendance records. | 58, 497. 00 | June 30, 1971 to June 29, 1972. |
| HSM–99–71–039—Physiologic and Subjective Reactions Evoked by Aversive and Neutral Noise, Bruce Margolis. | Southwest Research Institute, San Antonio, Tex., S. Schiflett.<br><br>Determine the nature and extent of physiologic changes evoked by a variety of aversive and nonaversive moderate level noises and their correlations with subjective responses to the same sounds. | 32, 377. 00 | June 30, 1971 to July 29, 1972. |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| NOISE—Continued | | | |
| HSM–99–71–052—Effect of Noise Exposure on a Young Adult Population, B. T. Scheib. | Memphis State University, Memphis, Tenn., John Fletcher. | 31, 319. 00 | June 30, 1971 to June 29, 1972. |
| | Obtain conventional and high frequency data on samples of young adults who have been exposed to various high level non-occupational noise sources. This research, in addition to providing baseline hearing data on a potential incoming industrial population will clarify the nature of hearing loss risks. | | |
| OTHER | | | |
| HSM–99–71–023—Environmental Hazards in the Chemical Industry, Ted Schoenborn. | Environmental Health Programs, Inc., Washington, D.C., Paul Witt. | 46, 107. 00 | June 30, 1971 to Mar. 29, 1972. |
| | Investigation of problems of the working environment of a selected group of workers in the chlor-alkalai process; will provide NIOSH with a booklet on the recognition, avoidance, and prevention of hazards in that industry. | | |
| HSM–99–71–030—Safety Research Priorities, Charles Powell, Vernon Rose. | Arthur D. Little, Inc., Cambridge, Mass., A. E. Wechsler. | 48, 976. 00 | June 30, 1971 to June 29, 1972. |
| | Develop a priority rating system and identify general areas and specific problems where fruitful and necessary research in occupational safety should be undertaken. | | |

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| HSM–99–71–050—Hospital Occupational Health Services Study, Marshall LaNier. | Computer Sciences Corp., Huntsville, Ala., F. B. Crandall.<br><br>Provide resource information on existing employee health services presently being provided in general hospitals in the United States. Also develop an acceptable action program to protect and promote the health of hospital employees. | 96, 616. 00 | June 30, 1971 to Sept. 29, 1972. |
| HSM–99–71–051—Sputum Cytology in Industrial Disease, William S. Lainhart. | University of California, Berkeley, Calif., W. C. Cooper.<br><br>Prepare a "state of arts" paper on the present knowledge regarding the use of sputum cytology in industrial diseases. | 11, 614. 00 | June 30, 1971 to Dec. 29, 1971. |
| HSM–99–71–062—An Evaluation of Chronic Mercury Exposures on EMG and Psychomotor Functions, E. J. Fairchild. | University of Michigan, Ann Arbor, Mich., Donald Chaffin.<br><br>Determine if the observed changes in the EMG's obtained from 2 workers with higher-than-normal mercury retentions are reproduced in a larger sample of exposed workers. Another objective will be to determine through controlled animal exposures how graded mercury body burdens occurring for varying durations affect the reversibility of neuromuscular function alteration as demonstrated by EMG power spectra monitoring. | 59, 951. 00 | June 30, 1971 to Dec. 29, 1972. |
| HSM–99–71–063—Effects of Alcoholic Intoxication on Occupational Safety and Health, E. J. Fairchild. | New York University, New York, N.Y., Erwin P. Tichauer.<br><br>Indicate ratio between level of intoxication and the interval of time of "sobering up" which must have elapsed before an individual can be assigned to tasks involving hazards to health and safety at the workplace. | 7, 556. 00 | June 28, 1971 to Sept. 28, 1971. |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| **PHYSIOLOGY AND ERGONOMICS** | | | |
| CPE R–70–0043—The Effects of Work Posture and Work Intensity on Pulmonary Function, Austin F. Henschel. | Pennsylvania State University, University Park, Pa., E. R. Buskirk. | 57, 719. 00 | June 29, 1970 to June 29, 1972. |
| | Perform laboratory investigations involving the variables of work intensity, work posture, work environment, and age of worker. These variables will be systematically varied to determine their effects, singly and in combination, on the pulmonary system of the body. | | |
| HSM–99–71–021—Static vs. Rhythmic Work—Industrial Fatigue, Austin Henschel. | St. Louis University, School of Medicine, St. Louis, Mo., Alexander Lind. | 88, 959. 00 | June 30, 1971 to June 29, 1973. |
| | Investigate the hypothesis that the static component in rhythmic exercise plays a significant role in the development of muscular fatigue in industry. | | |
| 68–03–0007—Effects of Dehydration on Heat Acclimatization, Austin Henschel. | University of Illinois, Urbana, Ill., Bruce Herbig. | 8, 528. 00 | Feb. 15, 1971 to June 14, 1972. |
| | Determine on humans the extent to which dehydration may alter the ability to acclimatize to heat stress. | | |
| **TRAINING** | | | |
| PH–86–65–92—X-ray Exposure and Occupational Safety and Health, William S. Lainhart. | Oregon State University, Corvallis, Oreg., Dale Trout. | 85, 000. 00 | June 1, 1965 to June 30, 1972. |

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| | Continue to provide teaching and training in X-ray science and engineering by maintaining and further developing training courses acceptable with the University's established program. Will provide for exploration, development and training and documentation of new approaches and methods for more effective teaching and training which may guide or be used as models for the establishment of needed similar education programs at other institutions as well as generate new ideas and provide national leadership in this expanding field of radiological health science. | | |
| HSM-99-71-041—To Develop Associate and Baccalaureate Degree Programs for Occupational Safety and Health Personnel, John M. Blankenhorn. | Texas A. & M. University, College Station, Tex., R. J. Vernon. | 27, 541. 00 | June 30, 1971 to June 29, 1972. |
| | Provide the means for developing B.S. and A.S. level academic curricula for occupational safety and health personnel. The report will provide colleges the guidance in developing curricula that are acceptable to employers and will guide NIOSH in approving and funding worthwhile grant requests. | | |
| HSM-99-71-045—Revision of Training Syllabus, William D. Kelley. | George D. Clayton & Associates, Southfield, Mich., George Clayton. | 160, 312. 00 | June 30, 1971 to September 29, 1972. |
| | Mechanism for the development of the Third Edition of the Public Health Service Publication, "The Industrial Environment—Its Evaluation and Control" through the utilization of the expertise and knowledge of individuals in universities, governmental organizations, and industry throughout the country. | | |
| HSM-99-71-060—Development of 20 weeks of Training for OS&H Personnel, William D. Kelley. | University of Oklahoma, Norman, Okla., W. Hartman. | 435, 016. 00 | June 30, 1971 to June 29, 1974. |
| | Provide new NIOSH employees with 12 weeks of intensive training and 8 weeks of field experience. Should prepare them to perform their functions as NIOSH field personnel doing occupational safety and health survey work in support of NIOSH objectives and responsibilities. | | |

## NIOSH CONTRACTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Contract period |
|---|---|---|---|
| **URANIUM** | | | |
| CPE–69–105—Evaluation of Underground Uranium Mine Environment in the State of Wyoming, Hugh C. Colman. | Wyoming Department of Public Health, Cheyenne, Wyo., Robert E. Sundin. | 36, 880. 00 | December 1, 1969 to December 31, 1971. |
| | Sample once a month, every worksite in every mine in Wyoming, for radon and radon daughter measurements and other significant epidemiological material. The data from these monthly samples shall be combined in quarterly reports for each mine. | | |
| CPE–69–109—Establish a System to Organize Data from Uranium Miner Studies, Victor Archer. | University of Utah, Salt Lake City, Utah, DeOrr Wright. | 299, 615. 00 | Dec. 1, 1968 to June 30, 1972. |
| | Design and implement the data retrieval systems, and the various computer programs involved in implementation of the several objectives associated with the statistical analysis of epidemiological data from uranium miner studies. | | |

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| CPE–69–119—Special Study of Uranium Miners, Victor Archer. | St. Mary's Hospital, Grand Junction, Colo., Geno Saccomanno. | 91, 883. 00 | April 15, 1969 to January 31, 1972. |
| | Prepare, examine, and interpret approximately 2,000 sputum slides each year from samples provided by the Government. Miners who show suspicious sputa, estimated to be 30 per year, will be transported to St. Mary's Hospital where the contractor shall carry out further tests. | | |
| BOSH–99–71–2—Evaluation of Working Level Concept in Uranium Mines, Hugh C. Colman. | Duncan Holiday, Salt Lake City, Utah. | 12, 385. 00 | Apr. 12, 1971 to Apr. 11, 1972. |
| | Evaluate the validity of the use of WL (work levels) and WLM (work level months) for the estimation of the radiation hazard produced by radon daughters. | | |
| HSM–99–71–012—Evaluation of Underground-Uranium Mine Enviromnent in State of New Mexico, Hugh C. Colman. | New Mexico Health and Social Services Department, Santa Fe, N. Mex., Aaron Bond. | 60, 995. 00 | June 25, 1971 to June 24, 1972. |
| | Develop an adequate body of accurate, unbiased environmental data with which it will be possible to evaluate the occupational exposure of groups. Every worksite in New Mexico will be sampled for radon daughter levels. | | |

# APPENDIX H

# NOISH GRANTS, BY PROGRAM AREA

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 1. ASBESTOSIS | | | |
| OH 00305–07 | Irving Selikoff, Jr., Mt. Sinai Hospital, New York, N.Y., "Asbestos Exposure and Cancer in the General Population." | $69, 524 | $75, 277 |
| OH 00320–05 | Irving Selikoff, Jr., Mt. Sinai School of Medicine, New York, N.Y., "Relation of Smoking to Neoplasia in Asbestos Workers." | 37, 609 | ---------- |
| OH 00323–06 | Andrew Reeves, Wayne State University, Detroit, Mich., "Inhaled Asbestos and Pulmonary Cancer and Pleural Mesothelioma." | 5, 109 | 78, 600 |
| OH 00326–04 | Paul Gross, Industrial Health Foundation, Pittsburgh, Pa., "Asbestos Dusts, Their Pathogenic Components." | 51, 246 | ---------- |
| OH 00332–03 | Ross W. Smith, University of Nevada, Reno, Nev., "Aqueous Surface Chemistry of Asbestos Minerals." | 66, 775 | ---------- |
| OH 00354–01 | Paul Gross, Industrial Health Foundation, Pittsburgh, Pa., "Dose-Effect Relationship of Asbestos Dust." | 36, 193 | ---------- |
| 2. BEHAVIORAL FACTORS | | | |
| OH 00331–03 | Elliot D. Weitzman, Montefiore Hospital and Medical Center, Bronx, N.Y., The Sleep-Waking Cycle and its Neuro-Endocrine Correlates". | 73, 924 | ---------- |
| OH 00346–01 | Earl L. Wiender, University of Miami, Coral Gables, Fla., "Computer-based Training for Watchkeeping Tasks". | 92, 476 | ---------- |

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| **3. BERYLLIUM** | | | |
| EC 00306–03 | Harriet L. Hardy, Massachusetts Institute of Technology, Cambridge, Mass., "Long Term Study of Beryllium Disease". | *None | ---------- |
| **4. BYSSINOSIS** | | | |
| OH 00302–01 | Kaye H. Kilburn, Duke University, Durham, N.C., "Prevalence, Pathogenesis and Control of Byssinosis". | $124, 816 | ---------- |
| OH 00304–08 | Arend Bouhuys, John B. Pierce Foundation, New Haven, Conn., "Physiological Studies on Byssinosis". | 67, 460 | ---------- |
| **5. ENGINEERING** | | | |
| EC 00207–12 | Gaylord W. Penney, Carnegie-Mellon University, Pittsburgh, Pa., "The Dust Layer and Precipitator Efficiency". | *None | ---------- |
| OH 00344–01 | Stuart A. Hoenig, University of Arizona, Tucson, Ariz., "A New Detector for Carbon Monoxide in Air". | *None | ---------- |
| OH 00345–02 | George C. Guilbault, Louisiana State University, New Orleans, La., "Use of Solid State Detectors in Air Pollution Research". | 26, 496 | ---------- |
| **6. NOISE** | | | |
| EC 00447–01 | W. B. Itturian, University of Georgia, Athens, Ga., "Behavioral Toxicity of Noise in Immature Mice". | *None | ---------- |
| OH 00341–01 | Paul L. Michael, Pennsylvania State University, University Park, Pa., "An Objective Method for Evaluating Ear Protectors". | *None | ---------- |
| OH 00350–01 | Wallace D. Ward, University of Minnesota, Minneapolis, Minn., "Damage-risk Criteria for Intermittent Noise Exposures". | 40, 235 | ---------- |

*See footnotes at end of table.

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 6. NOISE—Continued | | | |
| OH 00366–01 | Harold D. Warner, Curators of University of Missouri, Columbia, Mo., "Effects of Three Sound Environments on Human Behavior". | 0 | $8, 922 |
| OH 00365–01 | Norman W. Heimstra, University of South Dakota, Vermillion, S. Dak., "Noise and Human Performance" | 0 | 20, 243 |
| 7. OCCUPATIONAL RESPIRATORY DISEASE | | | |
| OH 00387–01A1 | Morton M. Ziskind, Tulane University, New Orleans, La., "Accelerated Silicosis in Sandblasters". | $70, 242 | ---------- |
| OH 00306–12 | Dean A. Emanuel, Marshfield Clinic Foundation for Medical Research and Education, Marshfield, Wis., "Farmer's Lung—An Experimental Investigation". | 31, 532 | 29, 584 |
| OH 00310–12 | Benjamin G. Ferris, Jr., Harvard University, Boston, Mass., "Respiratory Disease and Environmental Exposure". | 51, 176 | ---------- |
| EC 00227–03 | Edward D. Palmes, New York University Medical Center, New York, N.Y., "Study of Lung Structure and Function with Aerosols". | *None | ---------- |
| OH 00335–03 | E. Bingham Mattheis, University of Cincinnati, Cincinnati, Ohio, "Response of Alveolar Macrophages to Metals". | 32, 939 | ---------- |
| OH 00338–02 | Hollis G. Boren, Marquette School of Medicine, Milwaukee, Wis., "Autoradiographic Response of Lung to Inhaled Agents". | 34, 017 | ---------- |
| OH 00340–03 | Nedd Robert Frank, University of Washington, Seattle, Wash., "Respiratory Effects of Inhaled Gases and Aerosols". | 67, 254 | ---------- |
| OH 00353–01 | James H. Stebbings, University of Minnesota, Minneapolis, Minn., "Cardiorespiratory Changes in an Employed Population". | *None | ---------- |

*See footnotes at end of table.

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 7. OCCUPATIONAL RESPIRATORY DISEASE—Continued | | | |
| OH 00367-01 | Yves C. Alarie, University of Pittsburgh, Pittsburgh, Pa., "Respiratory Tract Irritants Mechanism and Tolerance". | 0 | $18,159 |
| 8. OCCUPATIONAL HEALTH PROGRAMS | | | |
| OH 00319-05S1 | A. Walter Hoover, Brookdale Hospital Center, Brooklyn, N.Y., "Occupational Health Service in Small Industries". | $24,378 | ---------- |
| 9. PHYSICAL AND CHEMICAL ANALYSIS | | | |
| EC 00217-06S1 | Eric C. Juenge, State College of Pittsburg, Pittsburg, Kans., "Butadienyl Plumbanes-Diels Alder and Other Reactions". | 2,000 | ---------- |
| OH 00324-04 | B. G. Stephens, Wofford College, Spartanburg, S.C., "Extraction of Metal Complexes by Propylene Carbonate". | 21,300 | ---------- |
| OH 00330-03 | Ronald L. Coleman, University of Oklahoma, Oklahoma City, Okla., "Measuring Carbon Monoxide Effects with Trace Metals". | 85,033 | ---------- |
| 10. PHYSIOLOGY AND ERGONOMICS | | | |
| OH 00308-16 | Harwood S. Belding, University of Pittsburgh, Pittsburgh, Pa., "Evolution of Stresses of Exposure to Heat". | 29,884 | ---------- |
| OH 00325-03 | David Minard, University of Pittsburgh, Pittsburgh, Pa., "Physiologic Response to Work Stress in Steelworkers". | 18,717 | ---------- |
| OH 00328-02 | Gordon G. Globus, University of California, Irvine, Calif., "Biologic Aspects of Host Factors in Accidents". | **None | ---------- |

**See footnotes at end of table.

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| **11. SAFETY** | | | |
| OH 00300–02 | George N. Quam, Villanova University, Villanova, Pa., "Protection of Eyes, Face, and Body". | $14,250 | ---------- |
| OH 00301–02 | George Snively, Snell Memorial Foundation, Inc., North Tarrytown, N.Y., "Head Protection of Industrial Workers". | 27,652 | ---------- |
| OH 00343–02 | George N. Bycroft, Jr., Stanford Research Institute, Menlo Park, Calif., "Mathematical Model of a Head Subjected to a Blow". | 36,802 | $37,675 |
| **12. TOXICOLOGY AND PATHOLOGY** | | | |
| OH 00303–14 | M. H. Samitz, University of Pennsylvania, Philadelphia, Pa., "Clinical and Laboratory Studies of Metal Sensitivity". | 26,883 | ---------- |
| EC 00158–11 | A. Walter Hoover, Columbia University, New York, N.Y., "Absorption and Excretion of Mercury in Man." | *None | ---------- |
| OH 00307–18 | James S. Chisolm, The Johns Hopkins University, Baltimore, Md., "The Biochemical Effects of Lead Poisoning". | 59,781 | ---------- |
| OH 00309–14 | Hervey B. Elkins, Massachusetts Department of Labor and Industries, Boston, Mass., "Factors Affection the Excretion of Industrial Poisons". | 13,554 | ---------- |
| OH 00312–08 | Carl A. Nau, University of Oklahoma Medical Center, Oklahoma City, Okla., "Occupational Health Hazards of Rubber Dust". | *None | ---------- |
| OH 00313–09 | Jorge L. Litvak, Pan American Health Organization, Washington, D.C., "Manganese Poisoning—A Metabolic Disorder". | 86,693 | ---------- |
| OH 00314–07 | Klaus L. Stemmer, University of Cincinnati, Cincinnati, Ohio, "Biological Effects of Chromium and Ferro-Chrome Alloys". | 18,204 | ---------- |
| OH 00315–09 | Sheldon D. Murphy, Harvard University, Boston, Mass., "Biochemical and Physiologic Response to Toxic Stress". | 30,129 | ---------- |

*See footnotes at end of table.

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 12. TOXICOLOGY AND PATHOLOGY—Continued | | | |
| OH 00316–07 | Kenneth C. Leibman, University of Florida, Gainesville, Fla., "Metabolism of the Carbon-Carbon Double Bond". | $39,030 | ---------- |
| EC 00229–04 | S. N. Pradhan, Howard University, Washington, D.C., "Toxicological Studies of Occupational Chemicals". | *None | ---------- |
| EC 00230–08 | Herbert H. Cornish, University of Michigan, Ann Arbor, Mich., "Occupational Hazards of Aminoethanols". | **None | ---------- |
| EC 00234–06 | Frederick Sperling, Howard University, Washington, D.C., "Turpentine Inhalation Toxicity". | *None | ---------- |
| OH 00321–04 | John E. Milner, University of Washington, Seattle, Wash., "In Vitro Studies of Occupational Dermatitis." | 52,046 | ---------- |
| OH 00322–04 | John M. Peters, Harvard University, Boston, Mass., "Health Hazards of the Di-isocyanates." | *None | $29,366 |
| EC 00315–03 | Rodney R. Beard, Stanford University, Palo Alto, Calif., "Effects of Carbon Monoxide on Human and Animal Behavior." | 107,912 | ---------- |
| OH 00337–03 | Harold G. Petering, University of Cincinnati, Cincinnati, Ohio, "A Study of Mechanisms of Occupational Cd Toxicity." | 51,589 | ---------- |
| OH 00339–02 | E. C. Vigliani, Universita Degli Studi Milano, Milan, Italy, "Chromosome Studies in Human Lead Poisoning." | 12,500 | ---------- |
| OH 00347–01 | Phyllis D. Kaplan, University of Cincinnati, Cincinnati, Ohio, "Biological Interactions of Environmental Metals." | 32,984 | ---------- |
| OH 00348–01 | Herbert H. Cornish, University of Michigan, Ann Arbor, Mich., "Enzyme Induction and Environmental Toxicants". | 44,707 | ---------- |
| OH 00349–01 | Leslie M. Klevay, University of Cincinnati, Cincinnati, Ohio, "Vanadium Toxicity, A Study of Mechanisms". | 31,262 | ---------- |
| OH 00352–02 | Eugene D. Robin, Stanford University, Palo Alto, Calif., "Lung Cell Function in Health and Disease". | 70,171 | ---------- |

*See footnotes at end of table.

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 12. TOXICOLOGY AND PATHOLOGY—Continued | | | |
| OH 00359-01 | Stanley B. Gross, University of Cincinnati, Cincinnati, Ohio, "Variables Affecting Estimation of Human Body Burden". | $68, 906 | ..... |
| 13. OTHER | | | |
| OH 00329-03 | Clyde Orr, Jr., Georgia Institute of Technology, Atlanta, Ga., "Formation of Nonvolatile Particulates from Organic Vapors". | 49, 698 | ..... |
| OH 00351-01S1 | George E. Briggs, Ohio State University, Columbus, Ohio, "Scientific Evaluation". | 15, 000 | ..... |
| OH 00362-07 | Vittorio Puddu, Centro Malattie Cardiovascolari, Rome, Italy, "Death Rates Among Italian Railroad Employees". | 0 | $2, 300 |
| 14. TRAINING | | | |
| OH 00002-06 | Norman W. Heimstra, University of South Dakota, Vermillion, S. Dak., "Accident Prevention Research". | 55, 892 | ..... |
| OH 00004-05 | Harry W. Case, University of California, Los Angeles, Calif., "Accident Causation". | 49, 871 | ..... |
| OH 00016-11 | Dade W. Moeller, Harvard University, School of Public Health, Boston, Mass., "Environmental Health". | 73, 625 | ..... |
| OH 00018-09 | Fred H. Shillito, Ohio State University, Columbus, Ohio, "Occupational Health". | 79, 159 | ..... |
| OH 00020-06 | Bernard D. Tebbens, University of California, Berkeley, Calif., "Environmental Health". | 69, 371 | ..... |
| OH 00024-05 | Ralph G. Nevins, Kansas State University, Manhattan, Kans., "Bioenvironmental Engineering". | 51, 400 | ..... |
| OH 00028-04 | Bernard Saltzman, University of Cincinnati, Cincinnati. Ohio, "Industrial Hygiene". | 144, 033 | ..... |

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 14. TRAINING—Continued | | | |
| OH 00031-03 | George C. West, University of Alaska, College, Alaska, "Environmental Physiology". | *None | |
| OH 00036-10 | Carl A. Nau, University of Oklahoma, Oklahoma City, Okla., "Occupational Factors in Health". | $73,044 | |
| OH 00037-08 | Bertram D. Dinman, University of Michigan, Ann Arbor, Mich., "Industrial Health". | 108,740 | |
| OH 00089-03 | Richard G. Pearson, North Carolina State University, Raleigh, N.C., "Systems Safety Engineering". | 77,702 | |
| OH 00099-02 | David A. Fraser, University of North Carolina, Chapel Hill, N.C., "Occupational Health". | 111,808 | |
| OH 00103-02 | Erwin R. Tichauer, New York University, New York, New York, "Occupational Biomechanics". | 110,261 | |
| OH 00118-02 | Kenneth C. Stewart, University of Pittsburgh, Pittsburgh, Pa., "Acoustic Environmental Control". | 102,847 | |
| OH 00129-02 | Donald W. Ross, University of Cincinnati, Cincinnati, Ohio, "Industrial Psychiatry". | 29,952 | |
| OH 00135-01 | Knowlton J. Caplan, Univesrity of Minnesota, Minneapolis, Minn., "Occupational Health". | 77,655 | |
| OH 00137-01 | Philip E. Enterline, Univerity of Pittsburgh, Pittsburgh, Pa., "Industrial Biostatistics". | 30,459 | |
| OH 00156-01 | William M. Anderson, California Community Colleges, Sacramento, Calif., "Occupational Safety and Health". | 23,241 | |
| OH 00162-01 | George H. Brooks Auburn University, Auburn, Ala., "Occupational Safety and Health". | 52,956 | |
| OH 00163-01 | John V. Grimaldi, New York University, New York, N.Y., "Occupational Safety and Health". | 138,897 | |

*See footnotes at end of table.

## NIOSH GRANTS, BY PROGRAM AREA—Continued

| Grant number | Name, institution, project title | Fiscal year 1971 support | Fiscal year 1972 support |
|---|---|---|---|
| 14. TRAINING—Continued | | | |
| OH 00201–01 | John Chellman, Indiana University of Pennsylvania, Indiana, Pa., "Bachelor of Science Program in Safety Management". | ..... | $72, 290 |
| OH 00002–01 | Thomas J. Coleman, National Association of Hearing and Speech Agencies, Washington, D.C., Short-term training project on "Industrial Hearing Conservation". | $12, 250 | ..... |
| OH 52856–01 | Mario C. Battigelli, University of California, Cardiovascular Research Institute, San Francisco, Calif., Special Fellowship. | 17, 746 | ..... |

*Supported by fiscal year 1970 funds.
**Supported by fiscal year 1969 funds.

# APPENDIX I

# NIOSH INTERAGENCY AGREEMENTS

| Title and NIOSH project officer | Agency and project officer | NIOSH funds to date | Agency funds to date |
|---|---|---|---|
| Aerosol Hazard Analysis, Jeremiah R. Lynch | Atomic Energy Commission, Harry J. Ettinger. Develop and evaluate air sampling methods to be used as a basis for air sampling criteria. Specifically, basic aerosol studies will be conducted leading to the development of prototype air samplers. | $110,000 | |
| Experimental Evaluation and Improvement of Current Anayltical Methods for Mercury, John R. Carlberg, John V. Crable. | Atomic Energy Commission, Los Alamos, Evan Campbell. Perform a full-scale experimental evaluation of recognized analytical procedures, currently in use, for the determination of mercury in air, urine, blood, and tissue. | 35,000 | |
| Gas and Vapor Sampling Tube Development, Donald J. Larson, John V. Crable. | Atomic Energy Commission, Los Alamos, Evan Campbell. Develop a new solvent and gas sampling system for the analysis of air for occupational health evaluation and also develop a method or methods of analyzing these gases and vapors after sampling. | 100,000 | |
| Respirator Protection Factor for Test Method Development, Alan K. Gudeman. | Atomic Energy Commission, Edwin C. Hyatt. Develop test equipment and test methods for determining the degree of protection afforded the wearer of dust, fume, and mist respirators. | 85,000 | |

## NIOSH INTERAGENCY AGREEMENTS—Continued

| Title and NIOSH project officer | Agency and project officer | NIOSH funds to date | Agency funds to date |
|---|---|---|---|
| Respirator Quality Control, Alan K. Gudeman | Atomic Energy Commission, Edwin C. Hyatt<br>Determine the characteristics of respirators and respirator components which require development of quality control test methods. Quality control test methods will also be developed. | $100,000 | |
| Thermal Environmental Effects, Austin Henschel | Emergency Health Services Division, HSMHA<br>NIOSH will study the effect of commonly used drugs such as analgesics, tranquilizers, blood pressure depressants, etc. on tolerance to heat stress and how the toxicity level of these drugs varies with the degree of heat stress. | | $181,462 |
| Hair Samples Analysis, George J. Butler | Environmental Protection Agency, Douglas I. Hammer.<br>Analyze human hair specimens for As, Cd, Cu, Pb, and Zn. These analyses are part of the followup of the Helena Valley Area Environmental Health Study started in the fall of 1969. | | 2,775 |
| Evaluation of Hearing Levels, Alexander Cohen | Federal Aviation Administration<br>Provides for a survey to be conducted by or under the direction of NIOSH to determine whether aircraft operations in a residential area in close proximity to an airport with a very high frequency of operations can affect the hearing sensitivity of the resident population. | | 50,000 |

| | | |
|---|---|---|
| In-Building Health Services, Paul E. Biondi | Division of Federal Employee Health Services, HSMHA.<br>Provides for NIOSH's contribution to the cost of operating the PHS/DFEH Health Unit for NIOSH employees. | 5,000 |
| Cotton Mill Dust Control, Jeremiah R. Lynch | Federal Prison Industries<br>A joint study and demonstration of cotton mill dust control in the Atlanta Penitentiary cotton mill will be carried out. Included in the study will be the design and construction of a local exhaust system for the picker rooms. | 15,000 |
| Taxpayer Data, Leonard G. Salvin | Internal Revenue Service, Alex Sintetos<br>Provides the last filing date for certain Federal taxpayers included in occupational health studies. | 4,700 |
| Detector Tube Certification, Paul Roper | National Bureau of Standards<br>Develop a system for the reliable evaluation of the accuracy and precision of gas detector tubes. | 140,000 |
| Micro Quartz Analysis, Howard Ayer, John Crable | National Bureau of Standards, Alvin Perloff<br>The National Bureau of Standards will investigate methods for the identification and quantitative analysis by X-ray methods of microgram quantities of crystalline minerals, particularly quartz. Two approaches will be tried. | 90,000 |
| Noise Meter Testing, Terry L. Henderson | National Bureau of Standards, Walter Koidan<br>Provides for laboratory tests on two Columbia SPL–103 sound level meters. | 6,600 |
| Grants Management, Alan Stevens | National Institutes of Health<br>Provides for grant review and approval services. | 16,000 |

## NIOSH INTERAGENCY AGREEMENTS—Continued

| Title and NIOSH project officer | Agency and project officer | NIOSH funds to date | Agency funds to date |
|---|---|---|---|
| Committee on Hearing, Bioacoustics and Biomechanics, Herbert Jones. | Naval Research, Office of | $22,000 | |
| | Provides for various types of assistance including application of available scientific information in the solution of current Institute operational problems, research planning to meet future operational problems, and promoting exchange of research information. | | |
| Liason with State Programs, Ronald D. Dobbin | Occupational Safety and Health Administration | | |
| | A second representative of NIOSH will be assigned to work closely with the Office of State programs of OSHA. The agreement will provide a basis of cooperation in carrying out joint responsibilities of NIOSH and the Office of State Programs of DOL as delineated by the Occupational Safety and Health Act of 1970. It will also provide assistance in the development of state programs for occupational safety and health. | | |
| Material Safety Data Sheets, Bob F. Craft | Occupational Safety and Health Administration | | |
| | A 3-month study will be conducted by HEW of data sheets obtained and submitted by DOL for the purpose of developing and planning a data sheet review program. | | |
| Provision of Analytical Services, John Crable, Russell Hendricks. | Occupational Safety and Health Administration | | |
| | Provides space and equipment at the NIOSH Western Area Occupational Health Laboratory for approximately ten OSHA employees to perform chemical analyses, calibration of instruments, and maintenance of instruments related to enforcement of the Occupational Safety and Health Act of 1970. | | |

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|---|---|---|
| X-ray Technician Training, William Lainhart | Radiological Health, Bureau of<br>Provides NIOSH support for the continuation of the X-ray Science and Engineering Laboratory project at Oregon State University. | 85,000 |
| Study of Occupational X-ray Exposure, Gerald Karches. | Radiological Health, Bureau of, LaVert C. Seabron.<br>Conduct a joint survey to determine the health hazards associated with industrial applications of X-rays such as quality control devices and nondestructive testing and develop criteria for the safety of X-ray machines in industry. | 3,000 |

# APPENDIX J

## NIOSH SPECIAL FOREIGN CURRENCY RESEARCH AGREEMENTS

| Number, title and project officer | Contractor and project director | Funds to date | Project period |
|---|---|---|---|
| 01–003–3—Experimental Infective Pneumoconiosis, L. J. Cralley. | Industrial Toxicology Research Center, Lucknow, India, S. H. Zaidi. Determine the role of infection and immune reactions in the development of asbestosis and related dust pneumoconiosis. This will involve a study in animals of the combined effect of different dusts common in the air in asbestos mining and processing and the various strains of suspected pathogens isolated from such dusts. | $209,888 | Mar. 1, 1970 to Feb. 24, 1974. |
| 02–001–3—Body Transport and Disposal of Toxic Chemicals and Biologic TV's, H. E. Stokinger. | Serbian Institute of Occupational and Radiological Health, Belgrade, Yugoslavia, Dusan Djuric. Determine the health hazards associated with exposure to carbon disulfide and lead in the working environment by studies on the mechanisms by which these substances are handled in the body. | 964,332 | Sept. 1, 1963 to Dec. 31, 1973. |
| 02–002–3—Studies on the Effects of Radioactive Parts of Uranium Ore, Joseph Wagoner. | Serbian Institute of Occupational and Radiological Health, Belgrade, Yugoslavia, Milos Kilibarda. Determine the metabolism of the radioactive elements which occur in uranium ores and mines and the effects of these materials on the health of workers who are mining and processing the ores. | 306,453 | Jan. 1, 1964 to Dec. 31, 1973. |

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|---|---|---|---|
| 02–003–3—Evaluation of Isoniazid as a Prophylaxis Against PMF, Philip E. Enterline. | Serbian Institute of Occupational and Radiological Health, Belgrade, Yugoslavia, D. Popovic.<br>Determine to what extent the administration of isoniazid can prevent complications (progressive massive fibrosis) in pneumoconiotics with X-ray negative for tuberculosis. | 51, 688 | Sept. 24, 1965 to Dec. 31, 1972. |
| 02–004–3—Effects of Non-Siliceous Mineral Dusts on Chronic Respiratory Disease, Philip E. Enterline. | Institute for Medical Research, Zagreb, Yugoslavia, Marko Saric.<br>Determine the effects of nonsiliceous mineral dusts on the development of pneumoconiosis and non-specific respiratory disease in coal miners and cement plant workers. Occupational and medical histories, physical examinations, pulmonary function tests and chest X-rays will be conducted on each worker selected in the various study groups. | 90, 914 | Jan. 18, 1967 to Jan. 16, 1972. |
| 02–005–3—Cardiopulmonary Function in Coal Miners Exposed to Differing Coal Dusts, William S. Lainhart. | Serbian Institute of Occupational and Radiological Health, Belgrade, Yugoslavia, Velimir Potkonjak.<br>Examine the cardiopulmonary function and work capacity of coal miners exposed to different amounts and composition of coal dust and relate these exposures to impairments such as pulmonary emphysema, chronic bronchitis, and pneumoconiosis. | 71, 870 | Dec. 1, 1967 to Nov. 31, 1972. |
| 02–006–3—Effects of Vegetable Dust on Respiratory Function, William S. Lainhart. | Andrija Stampar School of Public Health, Zagreb, Yugoslavia, Fedor Valic.<br>Study the relationship between occupational exposure to dusts of vegetable origin and chronic nonspecific respiratory disease (byssinosis) and determine the relationship between dust type and size and biologically active agents on lung function. | 73, 370 | May 1, 1968 to Apr. 30, 1973. |

## NIOSH SPECIAL FOREIGN CURRENCY RESEARCH AGREEMENTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Project period |
|---|---|---|---|
| 02-009-3—Detection of Health Hazards Due to Asbestos Exposure, William S. Lainhart. | Andrija Stampar School of Public Health, Zagreb, Yugoslavia, Fedor Valic. Study the prevalence of asbestosis in workers in asbestos mining and processing to assess lung function changes in these workers, particular emphasis to be given to the early changes; study the role of some metals contained in asbestos dust; and study the relationship between concentration of dust, length of exposure and pulmonary impairment and disease. | $403, 562 | June 25, 1971 to June 24, 1976. |
| 02-011-3—EEG Studies in Workers Exposed to $CS_2$, Lester Scheel. | Serbian Institute of Occupational and Radiological Health, L. Graovac-Leposavic. Correlate electroencephalographic (EEG) changes with clinical signs of carbon disulfide ($CS_2$) intoxication; relate EEG changes to exposure history to validate TLV for $CS_2$ based on human experience; identify the EEG changes during accumulative exposure and following removal from $CS_2$; evaluate the diagnostic significance of EEG changes; and evaluate the applicability of the detection of chronic $CS_2$ intoxication in workers. | 162, 274 | June 20, 1971 to June 19, 1976. |
| 02-012-3—Studies on Abnormal Lead Absorption, Lead Poisoning and Lead Chelation, E. J. Fairchild. | Institute for Medical Research, Zagreb, Yugoslavia, Tihomil Beritic. Determine the clinical morphological and biochemical effects which point to evidence for toxic action of lead on the bone-marrow, thyroid, kidney and central nervous system; synthesize and test new chelating agents for possible use for eliminating lead from the body and study their toxicity and efficiency for removing lead; and determine the effects of age on lead absorption and retention. | 348, 094 | June 12, 1971 to July 11, 1976. |

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|---|---|---|---|
| 02–015–2—Exposures in Cement Production and Chronic Lung Diseases, N. Leroy Lapp. | Institute for Medical Research, Zagreb, Yugoslavia, Marko Saric.<br>Determine the role of cement dust in the development of chronic nonspecific lung disease (CNLD) in workers in the cement industry; determine the relationship between extent of exposure and the CNLD to determine the degree and type of impairment in cement CNLD; and relate impairment to occupational and nonoccupational factors. | 168, 940 | Dec. 1, 1971 to Nov. 30, 1976. |
| 03–001–3—Environmental Assessment of Airborne Cotton and Flax Dust, L. J. Cralley. | High Institute of Public Health, Alexandria, Egypt, M. H. Noweir.<br>Isolate and identify the biologically active materials in cotton and flax which are responsible for the production of byssinosis in textile workers. Clinical, physiological, and epidemiological data will be generated on workers and related to exposure to the types of dust shown to be biologically active through the analysis of breathing zone dust samples collected in all areas of the cotton and flax processing and weaving operations. | 139, 500 | Sept. 28, 1969 to Sept. 28, 1974. |
| 03–002–3—Exposure to Noise in the Cotton and Flax Textile Industry, Herbert H. Jones. | High Institute of Public Health, Alexandria, Egypt, M. H. Noweir.<br>Indicate the effect of the levels and frequency distribution of steady noise and the duration of exposure on the hearing acuity of exposed workers in the textile industry and relate this data to safe level criteria for hearing protection from long-term exposure to noise. | 99, 440 | July 14, 1971, to July 13, 1975. |

## NIOSH SPECIAL FOREIGN CURRENCY RESEARCH AGREEMENTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Project period |
|---|---|---|---|
| 05-002-3—Irregularity in Excretion of Inorganic Mercury from the Body, Austin Henschel. | Institute of Occupational Medicine in the Textile and Chemical Industries, Lodz, Poland, Jerzy Piotrowski. Obtain systematic and detailed information on the mechanisms of excretion of mercury from the body and factors which might influence the excretion. The study will utilize rats exposed to a variety of doses of inorganic mercury salts and labeled organic mercury compounds. It will include systematic studies of the mechanism of mercury transport through the kidney tubules, of the identity of the chemical forms in which mercury is transported and excreted and of the influence of environmental and dietary factors that might alter mercury excretion. | $102,479 | Dec. 21, 1965 to Dec. 31, 1971. |
| 05-003-3—Effects of Carbon Disulfide in the Metabolism of Pyridine, Austin Henschel. | Institute of Occupational Medicine in Textile and Chemical Industries, Lodz, Poland, Teresa Wrodska-Nofer. Study the effects of carbon disulfide on the metabolism of pyridine nucleotides and nicotinamide-nicotinic acid. This study was designed to furnish basic data which would be helpful in understanding the pathogenesis of carbon disulfide intoxication in humans with diagnostic and treatment implications. Rats will be exposed to various levels of $CS_2$ and blood, urine, and tissue analysis will be performed for indications of disturbances in the metabolism of these important coenzymes and vitamins. | 97,458 | Dec. 21, 1965 to Dec. 31, 1971. |

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|---|---|---|---|
| 05–004–3—Respiratory Tract Disease of Cotton Workers Living in Air Pollution, Austin Henschel. | Institute of Occupational Medicine in Mining and Metallurgical Industries, Sosnowiec, Poland, Konrad Szymczykiewicz.<br>Determine the role of air pollutants such as oxides of sulfur and cyclic hydrocarbons on the development of pulmonary disease in textile workers exposed to high concentration of cotton dust. Workers will be studied in two Polish cotton textile plants, one isolated in an area of heavy air pollution and one in relatively low pollution. | 138, 796 | Dec. 21, 1965 to Dec. 31, 1971. |
| 05–005–3—Effects of Chronic Vibration and Noise Exposure on Workers Health, Alexander Cohen. | Research Institute of Social Medicine in Medical Academy, Lodz, Poland, Henryk Rafalski.<br>Determine the epidemiology of vibration disease in forestry workers; describe the patho-physiologic changes that occur; attempt to establish mechanisms involved in vibration disease; and determine the prevalence of noise induced hearing loss. | 212, 658 | July 23, 1968 to July 22, 1973. |
| 05–006–3—Mechanism of Sweat Gland Function, Austin Henschel. | Selesian School of Medicine, Katowice, Poland, Kornel Gibinski.<br>Determine the physiological basis of sweat-gland function. By the use of radioactive sodium, potassium, and calcium the rate and time of the appearance in the sweat of intravenously injected electrolytes will be measured in humans. A second approach concerns the influence of hormones on salt and sweat secretion. | 54, 737 | Jan. 8, 1969 to Jan. 7, 1972. |

## NIOSH SPECIAL FOREIGN CURRENCY RESEARCH AGREEMENTS—Continued

| Number, title and project officer | Contractor and project director | Funds to date | Project period |
|---|---|---|---|
| 05–010–2—Adaptation of the Cardiorespiratory System in Various Age Groups, Austin Henschel. | Cracow Industrial Medical Clinic, Cracow, Poland, Wiadyslaw Goszcz. | $118,999 | Dec. 31, 1971 to Dec. 31, 1974. |
| | Determine the relationship between the level of physical work demands of the job and the circulatory and respiratory responses as functions of age in men and women; determine normal values for the parameters studied and estimate limits of tolerance; determine the influence of level of physical fitness (work capacity) on adaption of circulatory and respiratory functions to effort in different age groups of men and women; and determine the correlation between the circulatory, respiratory, and energetic parameter responses to standardized work loads. | | |
| 06–002–3—Blood Flow Studies of People in Hot Enviroments, Austin Henschel. | Hebrew University, Hadassah Medical School, Jerusalem, Israel, S. Samueloff. | 76,133 | May 28, 1967 to Dec. 31, 1971. |
| | Determine the role of peripheral blood flow in heat tolerance during rest and work as it may be altered by ethnic origin and heat exposure history. Peripheral blood flow and other pertinent physiological parameters will be measured on subjects during rest, work and recovery at comfort temperatures and hot-dry conditions. | | |
| 06–003–3—Role of Age, Sex, and Ethnic Origin in Determining Heat Tolerance, Austin Henschel. | Tel-Hashomer Hospital, Tel-Aviv, Israel, E. Sohar. | 79,500 | May 11, 1967 to May 11, 1972. |
| | Determine the degree to which age, sex, ethnic origin, and occupation interacting influence the capacity of an individual to tolerate heat. Such data is needed to establish criteria for permissible heat exposure limits for the young and adult women and men who make up a working population. | | |

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|---|---|---|---|
| **06–004–3—Toxic Hazards and Body Reactivity of Workers, Jeremiah R. Lynch.** | Hebrew University, Department of Occupational Health, Jerusalem, Israel, Marcus Wassermann.<br>Obtain exposure-effect information on workers in a pesticide manufacturing plant where high environmental temperature occur during the summer months to determine the extent to which the heat and work play a role in the total hazards. | 200, 165 | May 13, 1968 to May 12, 1973. |
| **06–006–3—Energy Metabolism with Exposure to Low and High Ambient Temperatures, Austin Henschel.** | Negev Institute for Arid Zone Research, Beersheva, Israel, Yair Cassuto.<br>Study the intracellular metabolic alterations and cellular energy transformations that occur during exposure to heat and cold with acclimatization to heat and cold. Metabolic alterations at the cellular level will be done using liver, kidney, heart, and brown fat mitochondria from acclimatized and nonacclimatized animals. | 77, 239 | July 1, 1968 to July 4, 1972. |

APPENDIX K

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

## REQUEST FOR HEALTH HAZARD EVALUATION

This form is provided to assist in registering a request for a health hazard evaluation with the U.S. Department of Health, Education, and Welfare as provided in Section 20(a)(6) of the Occupational Safety and Health Act of 1970 and 42 CFR Part 85. (See Statement on Reverse Side)

Name of Establishment Where Alleged Hazard(s) Exist _____

Company Address { Street _____ Telephone _____
City _____ State _____ Zip Code _____

1. Principal Company Activity _____
(manufacturing, construction, transportation, services, etc.)

2. Specify the particular building or worksite where the alleged hazard is located, including address. _____

3. Specify the name and phone number of employer's agent(s) in charge.

4. Describe briefly the hazard(s) which exists by completing the following information:
Identification of Hazard or Toxic Substance(s) _____
Trade Name (If Applicable) _____ Chemical Name _____
Manufacturer _____ Does the material have a warning label? _____ Yes _____ No
If Yes, attach copy of label or a copy of the information contained on the label.
Physical Form: Dust ☐ Gas ☐ Liquid ☐ Mist ☐ Other ☐
Type of Exposure? Breathing ☐ Swallowing ☐ Skin Contact ☐
Number of People Exposed _____ Length of Exposure (Hours/Day) _____
Occupations of Exposed Employees _____
Activities of Employees During Exposure _____

5. Using the space below describe further the nature of the conditions or circumstances which prompted this request and other relevant aspects which you may consider important, such as the nature of the illness or symptoms of exposure, the concern for the potentially toxic effects of a new chemical substance introduced into the workplace, etc.

HSM-598
11/71

FORM APPROVED
OMB NO.68-R1236

6. (a) To your knowledge has this hazard been considered previously by any Government agency? _____

(b) If so, give the name and address of each.

_____

_____

(c) and, the approximate date it was so considered. _____

7. (a) Is this request, or a request alleging a similar hazard, being filed with any other Government agency? _____ (b) If so, give the name and address of each.

_____

_____

---

The undersigned (check one)

☐ Employer ☐ Authorized Representative of employees*

believes that a substance (or substances) normally found at the following place of employment may have potentially toxic effects in the concentration used or found.

_____

Signature _____ Date _____

Typed or Printed Name _____

Address { Street _____ Telephone _____

City _____ State _____ Zip Code _____

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If you are a representative of employees, state the name and address of your organization

_____

_____

Please indicate your desire:

☐ I do not want my name revealed to the employer.

☐ My name may be revealed to the employer.

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Authority:

Section 20(a)(6) of the Occupational Safety and Health Act, [29 U.S.C. 669(a)(6)] provides as follows: The Secretary of Health, Education, and Welfare shall...determine following a written request by any employer or authorized representative of employees, specifying with reasonable particularity the grounds on which the request is made, whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found; and shall submit such determination both to employers and affected employees as soon as possible. If the Secretary of Health, Education, and Welfare determines that any substance is potentially toxic at the concentrations in which it is used or found in a place of employment, and such substance is not covered by an occupational safety or health standard promulgated under section 6, the Secretary of Health, Education, and Welfare shall immediately submit such determination to the Secretary of Labor, together with all pertinent criteria.

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*An "authorized representative of employees" is defined [42 CFR Part 85.2(b)] as a person who represents the employees of the establishment from which the request originates for purposes of collective bargaining, or who has written authorization from two or more employees at the place of employment to represent them under the Act, or any employee in any case where three or less employees work for the same employer or in the same workplace. The written authorizations do not need to be attached to the request form.

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Send the completed form to:

U.S. Department of Health, Education, and Welfare
National Institute for Occupational Safety and Health
Division of Technical Services
Hazard Evaluation Services Branch
Cincinnati, Ohio 45202

# APPENDIX L
# SELECTED NIOSH PUBLICATIONS


Anderson, Daniel P., J. A. Seta and J. F. Vining: The Effect of Pulsation Dampening on the Collection Efficiency of Personal Sampling Pumps, DHEW, PHS, HSMHA, NIOSH, Cincinnati, Ohio, September 1971, TR–70.

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